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# HISTORICAL RESOURCES IMPACT ASSESSMENT LEASE NO. 22 (ASA PERMIT NO. 84-53)

Stanley Van Dyke and B.O.K. Reeves
LIFEWAYS OF CANADA LIMITED

# FOREWORD

This report describes the results of a survey of the historical resources of Syncrude's Lease 22 and complements three earlier Syncrude publications concerning historical resources (McCullogh, E.J. and B.O.K. Reeves. 1978. Historical resources impact assessment, western portion of Syncrude Lease No. 17, Alberta. Syncrude Environmental Research Monograph 1978-2; Syncrude Canada Ltd. 1974. The Beaver Creek Site: a prehistoric stone quarry on Syncrude Lease No. 22. Syncrude Environmental Research Monograph 1974-2; and, Syncrude Canada Ltd. 1973. Syncrude Lease No. 17: an archaeological survey. Syncrude Environmental Research Monograph 1978-4).

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# HISTORICAL RESOURCES IMPACT ASSESSMENT
# SYNCRUDE CANADA LTD.
# LEASE NO. 22
(ASA PERMIT NO. 84-53)

Prepared For:

SYNCRUDE CANADA LTD.
10030 - 107th Avenue
Edmonton, Alberta
T5J 3E5

By:

STANLEY VAN DYKE AND B.O.K. REEVES

LIFEWAYS OF CANADA LIMITED
317 - 37th Avenue N.E.
Calgary, Alberta
T2E 6P6

June 1985

# CREDIT SHEET

| | |
|---|---|
| PROJECT DIRECTOR: | STANLEY VAN DYKE |
| FIELD ASSISTANTS: | KASEY ACKER<br>GARY BREWER<br>JACK BROGAN<br>ART MCFADDEN<br>BOB STEINHAUSER |
| REPORT AUTHOR: | STANLEY VAN DYKE |
| LITHIC ANALYSIS: | STANLEY VAN DYKE<br>TOM HOFFERT |
| WORD PROCESSING: | SUSAN WEISS<br>BELINDA HAMILTON |
| DRAFTING: | CAROL POPLIN |

# SUMMARY

Syncrude Canada Ltd. contracted Lifeways of Canada Limited to carry out an Historical Resources Impact Assessment of their Bituminous Sands Lease No. 22 as a part of a continuing program of environmental research.

Archaeological field studies were carried out over a 32 day period in July and August with a crew of six persons. The archaeological program consisted of the examination of river banks, terraces, outcrops, knolls, ridges, sand flats, relic landforms (i.e., glacial beach ridges), and aspen/spruce islands believed to exhibit elevation differences not apparent in existing contour mapping. In the course of the program, 7,608 shovel tests were excavated for the purpose of locating prehistoric sites. Approximately 33% of the level of effort was expended on the Clearwater Plain including the shore of the Athabasca River and the terraces adjacent to the Beaver River. An additional 33% of the level of effort involved shovel testing of the banks and associated terraces of the MacKay and Dover rivers in the western portion of the lease. The remainder of the effort was expended in areas on the Dover Plain, away from the latter drainages.

Thirty-two new prehistoric sites and five historic sites were identified. In addition, an attempt was made to identify the location of Berens House and six previously recorded prehistoric sites were visited. The site of Berens House was not located.

Of the prehistoric sites, 25 (78%) were identified in shovel tests. The remainder were found in exposures including cart tracks, borrow pits, trails, and a recent area of timber clear cutting. The prehistoric sites consist of ten isolated finds, 13

small lithic scatters and nine large campsite/lithic scatters. All but two of the prehistoric sites were located in the east half of the lease. Of the five historic sites, all appear to be associated with present or recent fur trapping activities. Four of the sites consist of standing structures, one of which is presently in use. The fifth historic site consists of tent frames.

In the course of assessing the prehistoric sites, 2,846 artifacts were recovered. Of these, 2,417 artifacts were identified in the newly discovered sites. Nineteen of the artifacts were classified as tools, none of which were time or culturally diagnostic.

One previously known prehistoric site, the Beaver River Quarry, was determined to have high significance (HgOv-29) as was HgOv-54, a pictograph site. Seven others were determined to be of moderate significance, eight were determined to be of low significance and the remainder were found to be of no significance. Of the sites found to be of significance, all but two are located within the vicinity of the Beaver River quarry. No historic sites were determined to be significant as all post-date World War II and are associated with recent fur trapping activities.

Significant paleontological resources were tentatively identified in the course of literature studies. The Devonian Limestones are of greatest concern but lie below oil bearing sands.

## Recommendations

Of thirty-eight prehistoric sites assessed, two are known to be highly significant (HgOv-29 and HgOv-54). Of the remaining prehistoric sites, seven sites are known to be of moderate significance (HgOv-31, HgOv-50, HgOv-51, HgOv-63, HgOv-64, HgOv-65, and HgOv-70), and eight sites were found to be of low significance (HgOw-5, HgOv-56, HgOv-59, HgOv-60, HgOv-72, HgOv-75, HgOv-77). The remainder of the known prehistoric sites are of no significance or concern.

All but three of the significant prehistoric sites lie within or immediately adjacent to the provincially designated area for HgOv-29, the Beaver River Quarry site. In order to accommodate additional nearby significant prehistoric sites within the designation boundaries, we would recommend that the designation boundary be expanded southward far enough to include HgOv-72.

HgOv-59, HgOv-60 and HgOw-5 are significant and lie outside the designated boundaries of the Beaver River Quarry. Two of the sites, HgOv-59 and HgOv-60, are located on the south side of an unnamed tributary of the Beaver River and north of the existing borrow source. HgOw-5 is located at the north of a timber lease approximately 400 m to the northwest of a small beaver dammed lake at the north end of the lease.

It is recommended that the three sites above be investigated further or avoided by development, should it occur.

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# 1. INTRODUCTION

Syncrude Canada Ltd. contracted Lifeways of Canada Limited to carry out an Historical Resources Inventory and Assessment of their Lease 22 as part of a continuing program of environmental research. Lease 22, hereafter referred to as the study area, is located approximately 50 km north of Fort McMurray and three km south of Fort MacKay, Alberta. The study area, covering approximately 196 sq. km, lies between Lease No. 17, the site of the existing development, and the confluence of the MacKay River (Figures 1-4).

## 1.1 HISTORICAL RESOURCES

Historical resources are defined by The Historical Resources Act (Government of Alberta 1980) to be "any work of nature or of man that is primarily of value for its paleontological, archaeological, prehistoric, historic, cultural, natural, scientific or aesthetic interest".

## 1.2 STUDY OBJECTIVES

The primary objective of this study was to identify (inventory) and evaluate the historical resources located within the study area with particular emphasis on those resources which would potentially be of provincial concern. Secondarily, and in the absence of plans for immediate development or development within the foreseeable future, this study provides general recommendations for active protection measures and management of historical resources within the study area.

## 1.3 ENVIRONMENTAL SETTING

The study area is situated in northeastern Alberta adjacent to the Athabasca River (Plate 1) and extends westward away from the

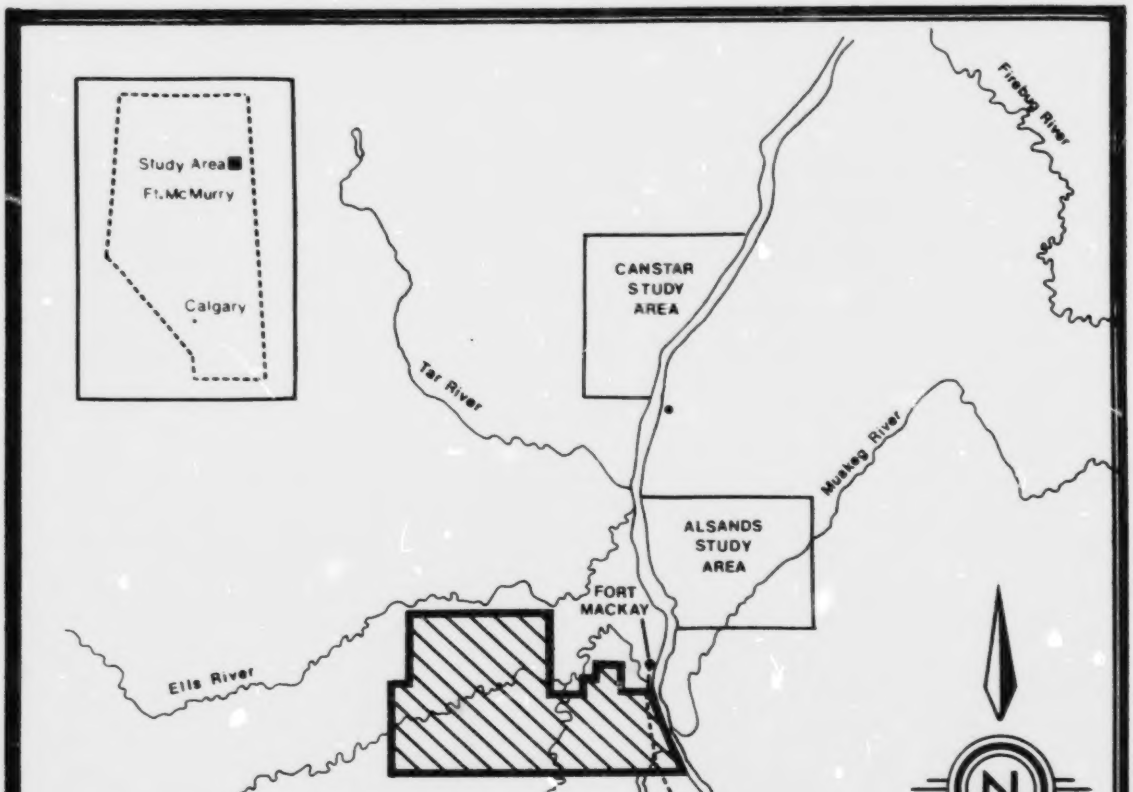

FIG. 1
HISTORICAL RESOURCES
IMPACT ASSESSMENT
SYNCRUDE CANADA LTD LEASE 22
STUDY AREA

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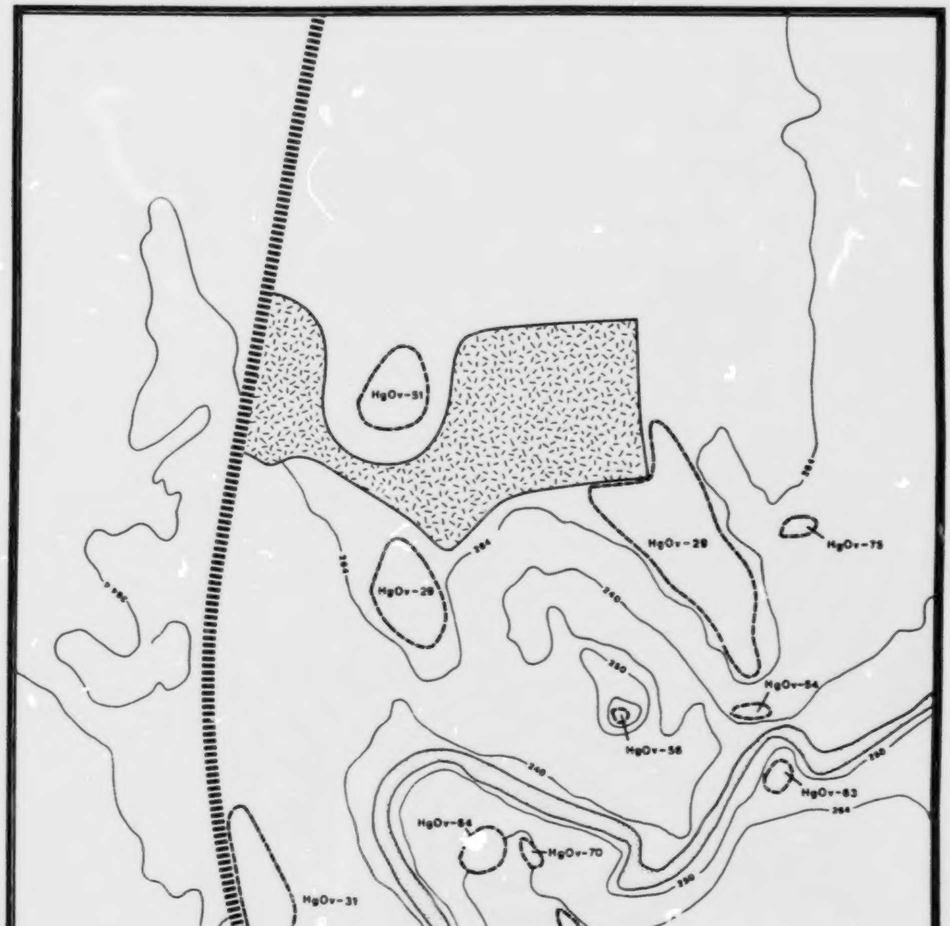


FIG. 2

HISTORICAL RESOURCES IMPACT ASSESSMENT

SYNCRUDE CANADA LTD LEASE 22

SITE LOCATIONS: BEAVER RIVER

river over a distance of approximately 21 km. The study area includes the upper reaches of the MacKay River (Plates 2 and 3), the confluence of the Beaver River (Plate 4), and the upper reaches of the Dover River (Plate 5). The study area lies wholly within the Clearwater Lowlands physiographic region (Government of Alberta and University of Alberta 1969). The study area may be further subdivided into the Clearwater Plain and the Dover Plain. The former includes areas between approximately 235 and 300 meters lying adjacent to the Athabasca River while the latter consists of lands between 300 and 500 meters located in the western portion of the lease and bisected by the Dover and MacKay rivers. Both the Clearwater and Dover plains are covered by a mantle of glacial drift with bedrock exposures restricted to the deeply entrenched river valleys and the Clearwater Plain (McPherson and Kathol 1977).

Small scale terrain features such as ridges, knobs and terrace edges and definable geomorphic features such as glacial lake beach ridges are present within the study area. Linear ridges and terrace features characterize the Clearwater Plain. In the western portion of the lease, terraces are present along the margins of the Dover and MacKay rivers. Multiple terrace systems in the interior areas of the lease are, however, fewer in number and frequently broken by slump blocks. Although the southwestern corner of the lease is characterized by a continuous slope representing the margins of the Thickwood Hills, most of the Dover Plain is of gradual slope. Small scale features, greater than 2 m, are generally absent except where they occur in association with beaver ponds and low relief channels. A single, possible beach ridge as identified from Landsat imagery (Syncrude Canada Ltd. 1983) is present north of the Dover River in the western portion of the lease. This is characterized by jack pine cover.

The surficial geology of the study area is characterized by glacial deposits (e.g., tills), glaciofluvial deposits (e.g., kames, outwash and meltwater deposits), and recent deposits (e.g., aeolian, lacustrian and alluvial deposits). In general, the former deposits form a veneer over much of the study area which is, in the western portion of the lease, overlain by glaciofluvial deposits. More recent deposits and features dominate the Clearwater Plain but also characterize existing channels throughout the study area (McPherson and Kathol 1977).

The study area also lies wholly within the Boreal Forest region (Rowe 1971) and is characterized by mixed woods dominated by trembling aspen. The distribution of trembling aspen, as compared to spruce is, in part, a reflection of past fire patterns (Reid and Sherstabeetoff 1984). The dominance of aspen is a function of its "rapid regeneration following disturbance" (McPherson and Kathol 1977). Aspen/spruce stands are associated with well-drained areas bordering on wetlands. These stands grade into spruce dominated areas on thin organic soils. Mature stands of spruce, relics of past fire patterns, are present in the southwest corner of the study area, in the deeply entrenched river valleys, and on the Clearwater Plain. Moderate to large stands of jack pine are associated with raised sandy areas. These occur at several locations within the Clearwater Plain increasing in number and extent to the south of the study area. In the western portion of the lease their occurrence is infrequent to rare. One of these is associated with a pro-glacial lake strand line.

The remainder of the study area is characterized by organic soils commonly referred to as muskeg. In the eastern and western portion of the lease, muskeg forms a significant amount of the cover.

The predominant exploitable resources of the lease include fish (e.g., whitefish, goldeye, suckers and pike) in the Athabasca and adjacent tributaries; ungulates including moose, elk and deer in the recent past or these in addition to wood bison and caribou in the more distant past; and fur bearing animals including beaver, muskrat and hare, all but the last being central to the economy of the early historic fur trade period.

The major exploitable plant resources include berries, birch, spruce and willow. The former formed an important element of prehistoric diet while the latter were exploited for building materials.

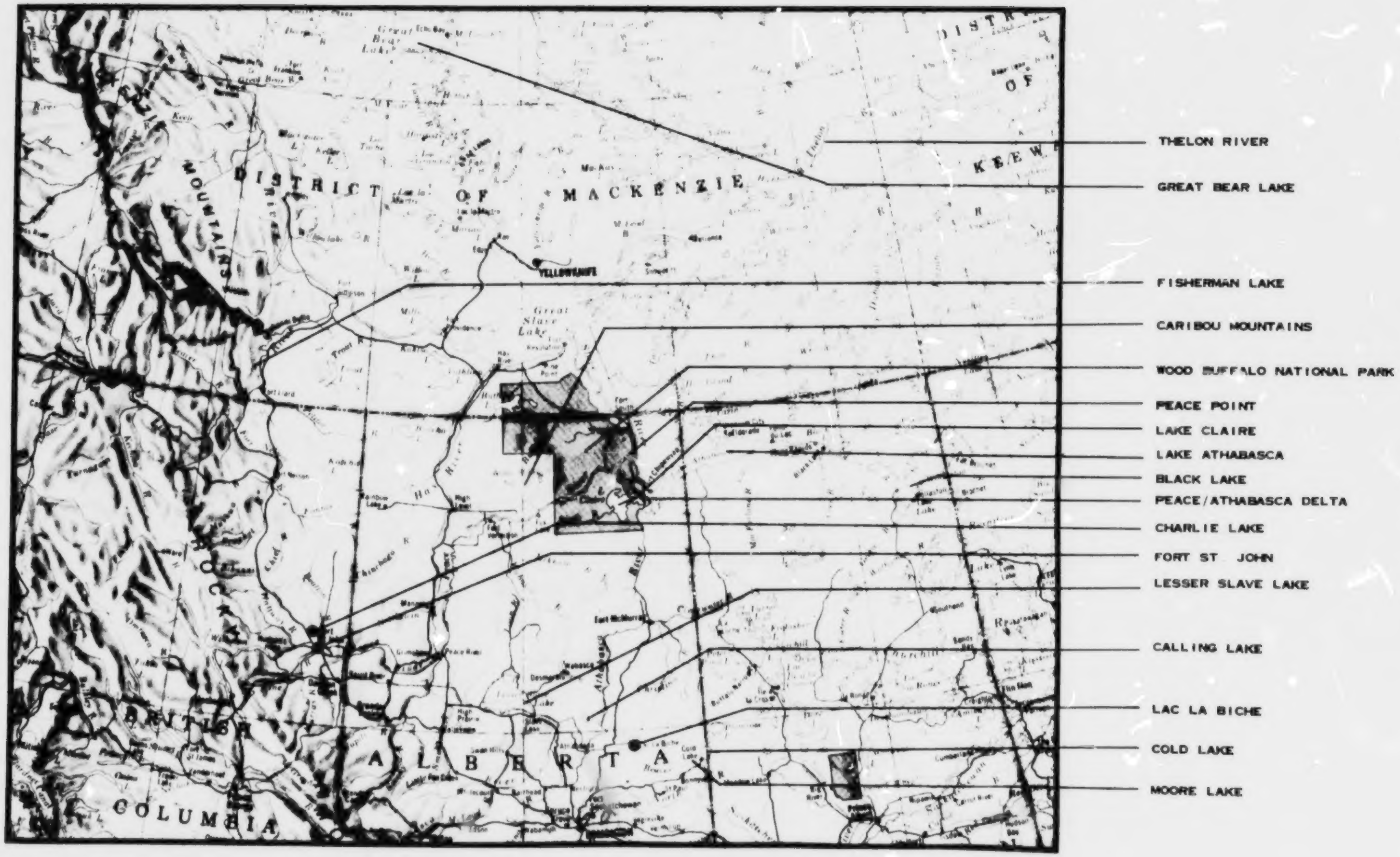
As documented in this and previous reports, Beaver River Sandstone, which outcrops on the Beaver River, was also a significant resource (Figure 2).

## 1.4 PREVIOUS ARCHAEOLOGICAL RESEARCH IN NORTHEASTERN ALBERTA (Figures 5 and 6)

In 1973 the Alberta Government enacted The Historical Resources Act, legislation designed to conserve and protect significant, provincial historical resources. Prior to this government requirement, Syncrude Canada Ltd. had already embarked on an environmental program which included a significant archaeological program (Syncrude Canada Ltd. 1973). That study resulted in the discovery of 31 prehistoric sites, including a major prehistoric stone tool quarry known as the Beaver River Quarry (HgOv-29). Investigations at the quarry site were continued in the following year (Syncrude Canada Ltd. 1974) and resulted in a Master's thesis out of the University of Calgary (Reardon 1976). The site is of central significance to the prehistory of northeastern Alberta. It is still the only known quarry in this vast region and served as a focus for prehistoric man's activities.

FIGURE : 5

PLACE
NAMES USED
IN TEXT



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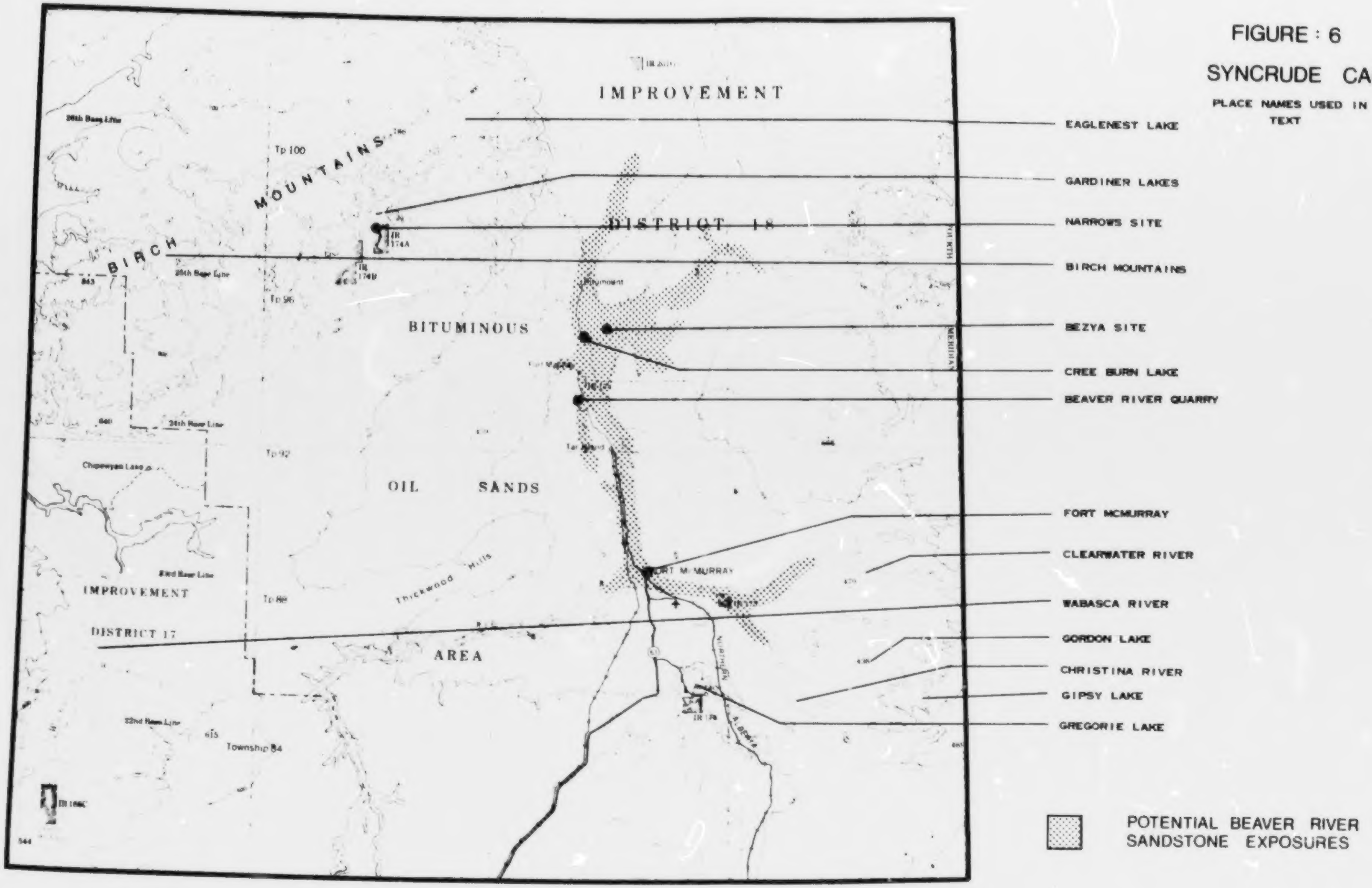


FIGURE : 6

SYNCRUDE CANADA

PLACE NAMES USED IN TEXT

SCALE - 1:1,000,000

In 1974, Losey, Freeman and Priegert (1975) identified five prehistoric sites in the region as a part of a governmental highways project. In the same year, Sims carried out a reconnaissance of Shell Canada's Lease 13 (Sims and Losey 1975, Sims 1975) which resulted in the identification of 38 prehistoric sites in road cuts and other exposed areas.

In 1975, Sims also carried out an archaeological survey along proposed highway routes within the region which resulted in the discovery of an additional two prehistoric sites adjacent to the Beaver River. A far-reaching archaeological reconnaissance, sponsored by Alberta Culture, was conducted by Donahue the same year. This survey involved the examination of portions of the Clearwater and Athabasca rivers, as well as the Birch Mountains (Donahue 1976a). This survey led to the preparation of the first monograph dealing comprehensively with the region (Donahue 1976b). The study was complemented by an archaeological survey along the Athabasca and excavations at the Gardiner Lake Narrows Site (Sims 1976a, 1976b).

In 1976 excavations were carried out at Wentzel Lake in the Caribou Mountains (Conaty 1977) and in the Birch Mountains at HkPa-4 (Ives 1977a, 1977b). In the same year, the Alberta Oil Sands Environmental Research Program sponsored the preparation of a comprehensive research design for archaeological studies in the region (Millar 1977). Archaeological survey continued along the Clearwater River and was complemented by surveys of Gregoire, Gypsy and Barker Lakes (Pollock 1977a). These surveys, in conjunction with the excavation of the Gros Roche Portage site (HeOn-1), the Limestone site (HdOr-1) and the Densmore site (HcOn-3), led to the preparation of a monograph addressing the prehistory of the Clearwater River region (Pollock 1978). Sims (1977) carried out Highway surveys in the region the same year.

After 1976, archaeological studies in the region, with the exception of studies carried out by the Archaeological Survey of Alberta, were undertaken primarily by contractors charged specifically with compliance with the terms of the Historical Resources Act. Studies in 1977 included Historical Resource Impact Assessments of the western portion of Syncrude Lease #17 (McCullough and Reeves 1978a) and proposed highway routes (McCullough and Reeves 1978b).

In 1978, an additional highway survey (Gryba 1978) as well as some of the earliest excavations on the Athabasca (Head 1979a, 1979b) were carried out. These were followed (in 1979) by archaeological surveys of a proposed townsite and airport north of the proposed Alsands site (Wood 1979), and of residential subdivisions in Fort McMurray (Fromhold 1979). Archaeological excavations were also carried out at HgOv-50 at the base of the Alsands Bridge (Gryba 1980a, 1980b) and at a series of sites in the Cree Burn Lake area (Mallory 1980). Concurrently, a major archaeological survey of portions of the Alsands Lease was being carried out by Conaty (1980). This study represents the first use of probabilistic, statistically based sampling techniques in the oil sands region.

In 1980, the focus of archaeological study in northeastern Alberta remained on the east side of the Athabasca River. Archaeological studies included additional survey of the Alsands Lease (Ronaghan 1981a), the proposed townsite, an energy corridor (Ronaghan 1981b), and a proposed pipeline route (Ronaghan 1981c). The former study successfully combined judgemental and probabilistic sampling strategies resulting in the discovery of a clear pattern of prehistoric site associations with elevated landforms. Small scale archaeological surveys were also carried out for Texaco Canada Resources Ltd. on their West Fort McMurray and Steepbank leases (Van Dyke 1980a and 1980b). In addition, the excavations in the Birch Mountains, started in 1976, were continued (Ives 1981a). Losey (1980) carried out an archaeological study designed to delineate the boundaries of the Beaver Creek Quarry site (HgOv-29). Jack Ives (1980) carried out a preliminary assessment of the lower MacKay River. The results of archaeological studies in Northeastern Alberta prehistory were summarized in a paper delivered to the Archaeological Society of Alberta in the fall of 1980 (Ives 1980, 1981b).

Archaeological studies in 1981 shifted northwards to the Nova-Petro-Canada and Canstar leases (McCullough 1981a, 1981b, 1981c, 1981d, 1981e, 1981f and McCullough and Wilson 1982). Archaeological studies were continued in the Birch Mountains (Ives 1982), and conservation studies were carried out at HhOv-16--the Cree Burn Lake Site (Ronaghan 1982). Ives (1981c) carried out a post-disturbance archaeological survey of portions of the Alsands Lease and, with M. Fenton, initiated a series of studies designed to better define a major lithic type quarried in the area (Fenton and Ives 1982, 1984; Ives and Fenton 1983). Ives with Hardie (1983) discussed the distribution and characteristics of other lithic sources known to originate in the region.

In 1982, archaeological studies continued on the Canstar Lease, in the Fort McMurray area, in the Birch Mountains, in the Beaver River area (Archaeological Survey of Alberta 1984), and at HhOv-73 (Le Blanc 1984), the Bezya microblade site in the Alsands study area. In 1983, archaeological studies continued at the Bezya Site, at the Beaver Creek Quarry, and at the AOSTRA Underground Test Facility site and associated access road (Fedirchuk 1983).

## 1.5 OTHER RESOURCES

In addition to the archaeological literature cited above the study design made considerable use of existing maps, aerial photography and mosaics. Soils maps, vegetation maps and surficial geology maps at 1:50,000 were drawn from existing AOSERP reports (AOSERP 1978). Smaller scale mapping, at a scale of 1:250,000, of the surficial geology were drawn from Bayrock (1971). Cultural features were drawn from 1:20,000 scale orthophoto mosaics with a contour interval of two metres, produced in 1981 and made available by Syncrude Canada Ltd. A mapping of organic (muskeg) deposits beween the MacKay River and Higway 63 was used to exclude areas for further study. This map series was produced by Syncrude Canada Ltd. in 1982 and 1983. The mapping and mosaic coverage was complemented by aerial photography at a scale of 1:20,000 produced by North West Survey Corporation International Ltd. (Series NW89880) in August of 1980.

Field recording of locations examined, sites inventoried and various other information was compiled onto the existing 1:20,000 orthophoto mosaics.

Since production of the available maps, mosaics and air photographs used for the conduct of this study, a number of significant land use changes have occurred. As these features may be used in the description of site locations, it should be noted that the alignment of the MacKay Road has been modified at the north edge of the lease. Similarly, a large area west of the road near the north end of the lease has been recently clear cut.

## 2. METHODOLOGY

For methodological, practical and theoretical reasons the archaeological study of Lease 22 involved the pre-qualification (i.e., stratification) of the study area with respect to its potential for yielding evidence of prehistoric resources and archaeological sites.

From a methodological standpoint, it was assumed that inventory productivity, in terms of the rate of site discovery, would be improved in proportion to the degree to which the area subject to inventory could be reduced by means of careful selection of sample areas. Consideration of the results of previous archaeological studies with respect to the location of prehistoric and historic sites assisted in the selection of sample sites.

From a practical standpoint, it was necessary to identify those attributes of probable site location which could be defined from existing maps and/or photographs. For this reason, considerable use was made of existing contour maps and aerial photography.

From a theoretical standpoint, it was assumed that the archaeological site distributions would reflect, in part, the distribution of animal and material resources available to the prehistoric and historic occupant. For this reason, existing faunal and geological data was considered in the design of this study.

A detailed evaluation of discovery strategies previously employed by archaeologists within the region was carried out prior to the planning of field studies (Appendix 1). It was concluded that a reasonably modest program of archaeological discovery could be employed and that this program would achieve efficiencies and success comparable to past programs by carefully prequalifying the study area with respect to its prehistorical potential. The historical potential of areas within the lease was established on the basis of existing data, theoretical models of site distribution (i.e., ethnographic analogy, optimizing models, and archaeological expectations) and expectations based on previous discoveries elsewhere (Appendix 2).

## 2.1 INVENTORY AND ASSESSMENT

### 2.1.1 Paleontological Inventory Strategy

Field inventory programs did not address paleontological concerns. Vertebrate paleontological materials are rare and associated with gravels. They would be expected to occur, if present, in deeply buried contexts and would not be discoverable in the course of field studies. Paleontological concerns in a more general sense were addressed in the course of a literature survey. A considerable body of geological literature is available for the study area and surrounding region. Significant geological sections, cores and finds have previously been noted, and fossiliferous strata have been previously identified (e.g. Russell 1932, Mellon and Wall 1956 and Pocock 1962). These features generally form continuous distributions which permit a wide latitude in mitigation strategies. Strata and areas of concern are noted in Section 3.1.

### 2.1.2 Prehistoric Resource Inventory Strategy

As noted above, the prehistoric resource inventory strategy was designed so as to maximize effort expended in areas within the lease having highest probability of containing resources. At the onset of the program, areas known to have a high potential for site location were included within the search parameters. These include river banks (Plate 1), lake shores (Plate 6), terraces above water bodies, and pronounced landforms, wherever they occurred (Plate 7). Secondarily, so as to permit identification of prehistoric resources away from these primary locations, the study area was stratified on the basis of relief as evidenced by well-drained areas. These areas were identified through the use of existing soils and vegetation maps, and/or recent 1:20,000 scale aerial photography. Field studies focused on areas determined to have relief as identified on 2 m contour mapping of the study area. [On the advice of the Archaeological Survey of Alberta, the study design was modified to include a minimum of six crew days to examine at least twenty less pronounced areas of relief characterized simply by the presence of vegetation suggestive of raised and/or well drained lands (Plate 8).]

Archaeological studies included foot traverses of identified areas of concern. Linear features were examined along a single zone consisting of three transects. Standard shovel tests, excavations approximately 50 cm on a side, were conducted at 50 m intervals along each transect. This resulted in the excavation of single tests approximately every 17 m along the feature in addition to judgemental tests wherever they were felt to be warranted. In every instance, judgemental tests were clustered. Areas examined are detailed in Figure 3.

Prehistoric sites were photographed, described and their location marked on available mapping and aerial photography. Locations were recorded in UTM (Universal Transverse Mercator) coordinates. Prehistoric sites are designated by Borden numbers, a system by which locations are recorded sequentially within blocks that are ten seconds of latitude and ten seconds of longitude.

Once identified, additional information was acquired from each prehistoric site by means of excavating additional shovel tests. The number of shovel tests was, more or less, tailored to the size and nature of the find. Isolated occurrences were assessed with between two and four shovel tests. The failure to locate additional material with such a number of tests was considered indicative of a small or isolated occurrence of little or no value. Larger finds often involved the excavation of a considerably larger number of tests. These were excavated in a systematic manner outwards from the find until negative finds replaced positive finds in a majority of cases. The objective of the testing was to acquire information on the distribution, density and contents of the finds, to determine whether stratigraphy was present, and to determine whether features or preserved organics were present. All prehistoric sites were flagged at the time of examination.

## 2.1.. Historic Resource Inventory Strategy

Potential historical resources were identified prior to beginning the field study. Historical use areas of recent vintage were expected along the Athabasca River and in the hinterlands. The former would likely be associated with river travel campsites and/or fishing (at confluences). The latter, hinterland sites, would likely be associated with fur trapping activities. Historic aged features dating to the fur trade era are limited to the potential presence of Berens House (also referred to in the literature as the Red River Post and Berens Fort) (Chalmers 1974). This site is reported to be located at the confluence of the MacKay and Athabasca rivers (Plate 3) which is outside of the study area. However, having assessed the potential significance of the find, Syncrude requested that this and adjacent areas be examined carefully for traces of historic use. Inventory of historic sites was conducted in a manner similar to and at the same time as the searches for prehistoric sites.

## 2.2 SIGNIFICANCE

The stated aims of the Archaeological Survey of Alberta are to:

- Preserve and protect a representative sample of archaeological resources of high quality for each of the cultural periods and regions within the province;
- Provide explanations and/or resolve problems related to regional cultural history and/or the management of historical resources as from time to time are found to be relevant to, or a part of, stated provincial research objectives; and
- Interpret the prehistoric and historic record of the province to the public through relevant historic resources or media.

(Donahue 1982:259)

It is the stated responsibility of the Province for establishing "the rules for determining significance" (ibid. 261). In the absence of such rules, guidelines or criteria, archaeological significance has been addressed ad hoc in the course of report review. Such assessments have proved to be more or less consistent and favorable to protection/mitigation whenever archaeological values could be demonstrated.

### 2.2.1 Evaluation Criteria

### 2.2.1.1 Paleontological

Criteria for determining significance of paleontological sites involve a consideration of both public and scientific values. From a scientific standpoint, it is of concern as to whether the site/section/formation contains information which would enhance or alter our understanding of paleoenvironments or contribute to other scientific disciplines or industry. From an interpretive perspective, the value of paleontological remains centres on significant localities or collections and is mitigated by its condition and location relative to tourist destinations.

The Devonian formations, as well as more recent fossiliferous zones, contain information bearing on paleoenvironmental changes within the region, particularly with respect to marine transgressions, deltaic environments and their respective fossil assemblages. However, because of the widespread nature of such deposits, it is not reasonable to provide site specific evaluations. In general, the significance of such resources is low with the resources being of moderate value to scientific ends. In this context, concern for the resource is best expressed in the course of outlining means of mitigating impacts to the resources.

### 2.2.1.2 Prehistoric

In the absence of Alberta Culture guidelines for prehistoric site assessment, the British Columbia Heritage Conservation Branch (1982) system of site evaluation was used for evaluating the prehistorical resource sites identified during the present study. The system is based on a series of presence/absence questions pertaining to the attributes of the site. The attributes include stratigraphy, chronologically sensitive cultural items, datable materials, variability in tool collections, intra-site activity areas, functionally diagnostic tools, faunal and floral material, exotic cultural material, paleoenvironmental data and existing disturbance. Together these criteria establish the quality of the site.

In previous applications of these criteria it has been found that the individual criteria are highly inter-correlated. This serves to cumulatively enhance the measured values of sites with respect to the selected criteria. However, as measured by these criteria, most prehistoric sites in the Boreal forest tend to rank low. For example, Boreal forest sites tend to lack clear stratigraphy; chronologically sensitive cultural specimens; datable carbon, faunal and floral remains; features; and for that matter, tools in general. Further, because of difficulties in locating sites in the Boreal forest, a high proportion of identified sites are found to be associated with disturbed areas where visibility is high.

Use of this ranking scheme in the Boreal forest is further complicated by unusual relationships in the data. For example, in large sites the relationship between the number of tools and the frequency of debitage may perform as a reliable measure of value, however, isolated and small sites exhibit a disproportionately high number of tools relative to debitage. This, no doubt, is an expression of function, but at the same time it renders a ranking on this variable meaningless. As such, the tabular ranking of the sites is not sufficient, of itself, to assess the value of the site or to determine mitigation requirements.

### 2.2.1.3 Historic

An historic resource of any type is significant when it is found to further the aims of provincial historic resource management. These aims, as previously noted, include conservation of unique and/or representative resources and research/interpretation of resources where they are found to exhibit information of methodological and/or substantive value (Donahue 1982:259). Within the context of each of these aims, an historic resource may be of high, moderate, low or no significance.

Sites of high significance are preserved and, preferably, designated. Sites of moderate significance are preferably avoided but may be mitigated by scientific study; the level of study being determined, in part, by the condition and value of the site. Sites of low significance are normally mitigated by excavation in lieu of active protection measures.

The significance of historic sites is highly dependent on site condition, the presence of standing structures, and strong association with important events. Ultimately, the assessment of such sites is, in part, a function of their potential for public interpretation (i.e., their location relative to tourist destinations, etc.). The scientific significance of historic sites is very difficult to demonstrate at present. Of the known or suspected historic resources within, or adjacent to, the study area, only Berens House is of potential significance.

# 3. RESULTS AND DISCUSSION

## 3.1 PALEONTOLOGICAL RESOURCES

As noted, paleontological resources were not addressed in the course of the inventory program. The paleontological resources (e.g., floral and faunal fossils, casts and similar materials) are associated with a number of geological strata.

Paleontological materials are of value for stratigraphic correlations and for the determination of facies as a part of reconstructing the depositional regimes responsible for the formation of the rock units. Although the paleontological resources of the study area have not previously been singled out as an historical resource concern (e.g., Ronaghan 1981a, Conaty 1980), the issue has recently surfaced. As identified by personnel from Alberta Culture (Le Blanc 1984:personal communication), the fossil assemblages associated with the Moberly Member of the Devonian Waterways formation (the Beaver Hill Lake Limestones) are of particular scientific interest. These outcrop on the Athabasca, along the lower reaches of the MacKay River, and presumably underlie the entire study area (McPherson and Kathol 1977). Impact to this formation would require excavation below the bituminous sands or specific mining of the limestones at their exposures. As such developments are not projected for either the near or long-term, such concerns are not presently warranted. A structural contour map of the top of the Devonian Waterways formation appears in McPherson and Kathol (1977:Figure 8).

Paleontological material is also associated with various sedimentary facies of the McMurray formation. Carrigy's (1973) middle unit is described as containing "plant remains, worm casts, logs of wood, and thin coal beds" (McPherson and Kathol

1977). This appears to represent overbank muds in a salt marsh environment (Stewart and MacCallum 1978). Further, in his summary of stratigraphic data for the Oil Sands Reservoir, Carrigy (1973:Table 3) states that fossils including ammonites, pelecypods, and calcareous foraminifera are associated with the open shelf marine environment of the Clearwater Formation; that pyritized foraminifera, radiolaria, sponge spicules, diatoms, dinoflagellates, and hystrichoshaerids are associated with the nearshore marine environments of the Clearwater formation; that molluscs, agglutinated foraminifera, fish teeth, spores and pollen grains are associated with the deltaic, tidal channel, and lagoon environments of the Upper McMurray formation; and that spores and pollen grains are associated with the deep brackish water and deltaic forest beds of the Middle McMurray formation.

The Tyrrell Museum of Paleontology is responsible for establishing the significance of paleontological remains. The aims of paleontological resource management are to provide for the protection of significant collecting locales, sites suitable for public interpretation, and sites containing significant scientific data.

No paleontological sites have been designated within the Oil Sands region. The Tyrrell Museum, however, has recently produced a map locating zones of paleontological sensitivity (Alberta Bureau of Surveying and Mapping 1984). According to the published map there exist zones of high paleontological potential on the west side of the Athabasca (Figure 7) in Section 1-95-11-W4M and Sections 1 and 2, 93-10-W4M. Areas of moderate potential are present in Section 3-95-11-4 and Section 29-94-11-4. Zones of low potential are present along the shore of the Athabasca and along the course of the Dover and MacKay rivers.

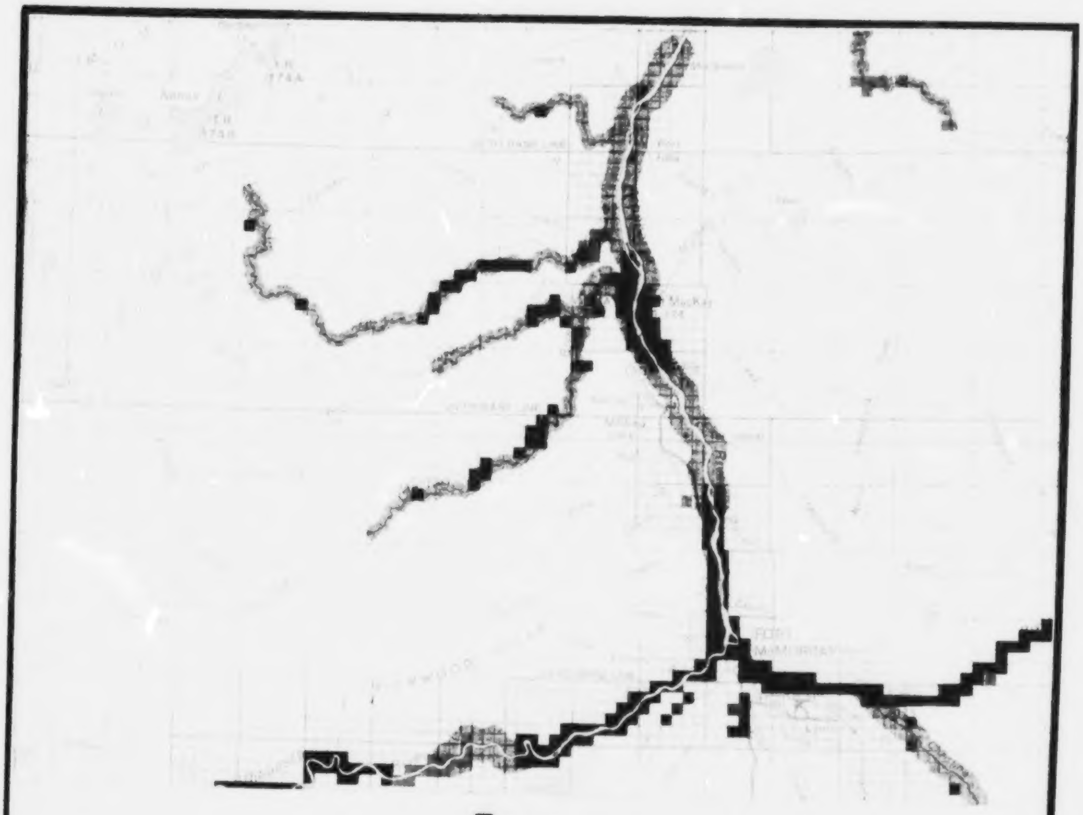


FIGURE: 7

**Alberta**
**CULTURE**
**TYRRELL MUSEUM OF PALAEONTOLOGY**

1:1 000 000

km 10 0 10 20 30 40 50 60 70 80 km
miles 10 0 10 20 30 40 50 miles

## PALAEONTOLOGICAL RESOURCE SENSITIVITY ZONES

SUBJECT TO CHANGE WITHOUT NOTICE

*This map has no statutory or regulatory sanctions.*

**HIGH** ■ **MEDIUM** ■ **LOW** ■

**PROBABLE** ▨ **UNKNOWN** □

## 3.2 PREHISTORIC SITES

Archaeological field studies were carried out between July 10 and August 8, 1984 (Figure 3). Field studies involved 153 man days. In the course of this program 7,608 shovel tests were excavated for the purpose of locating prehistoric sites. Thirty-two new prehistoric sites were identified (Figure 4), 25 (78%) of which were identified in shovel tests with the remainder (7) being found in surface exposures including cart tracks, borrow pits, trails, and a recent timber clear cut area. The sites consist of ten isolated finds, 13 small lithic scatters and nine large campsite/lithic scatters.

All but two of the sites were located in the east half of the lease. Both of the sites in the west half of the lease were associated with the MacKay River and consisted of isolated finds. The 30 prehistoric sites located in the east half of the lease were found to be associated with the Athabasca River, the Beaver River, the upper reaches of unnamed tributaries, and an area of knobs and lows in the vicinity of a small beaver dammed lake.

Two thousand eight hundred forty-six artifacts were recovered in the course of the inventory program (Figures 8, 9; Appendix 3). Of these, 2,517 artifacts were identified in newly discovered sites. Nineteen of the artifacts were classified as tools. None of the tools, however, were time or culturally diagnostic. Tools included retouched/utilized flakes, pebbles and cores (N=10), scrapers (N=3), unifaces (N=2) and bifaces/biface fragments (N=4). All but a very small number of the artifacts are of Beaver River Sandstone. Other materials represented include pebble cherts (N=2) and quartzites (N=8).

Table 1 provides a key to the evaluation of the prehistoric

FIGURE 8 RELATIVE PERCENTAGES OF PRIMARY REDUCTION, SECONDARY REDUCTION AND TOOL MANUFACTURE AND FINISHING

● BEAVER RIVER ASSOCIATION

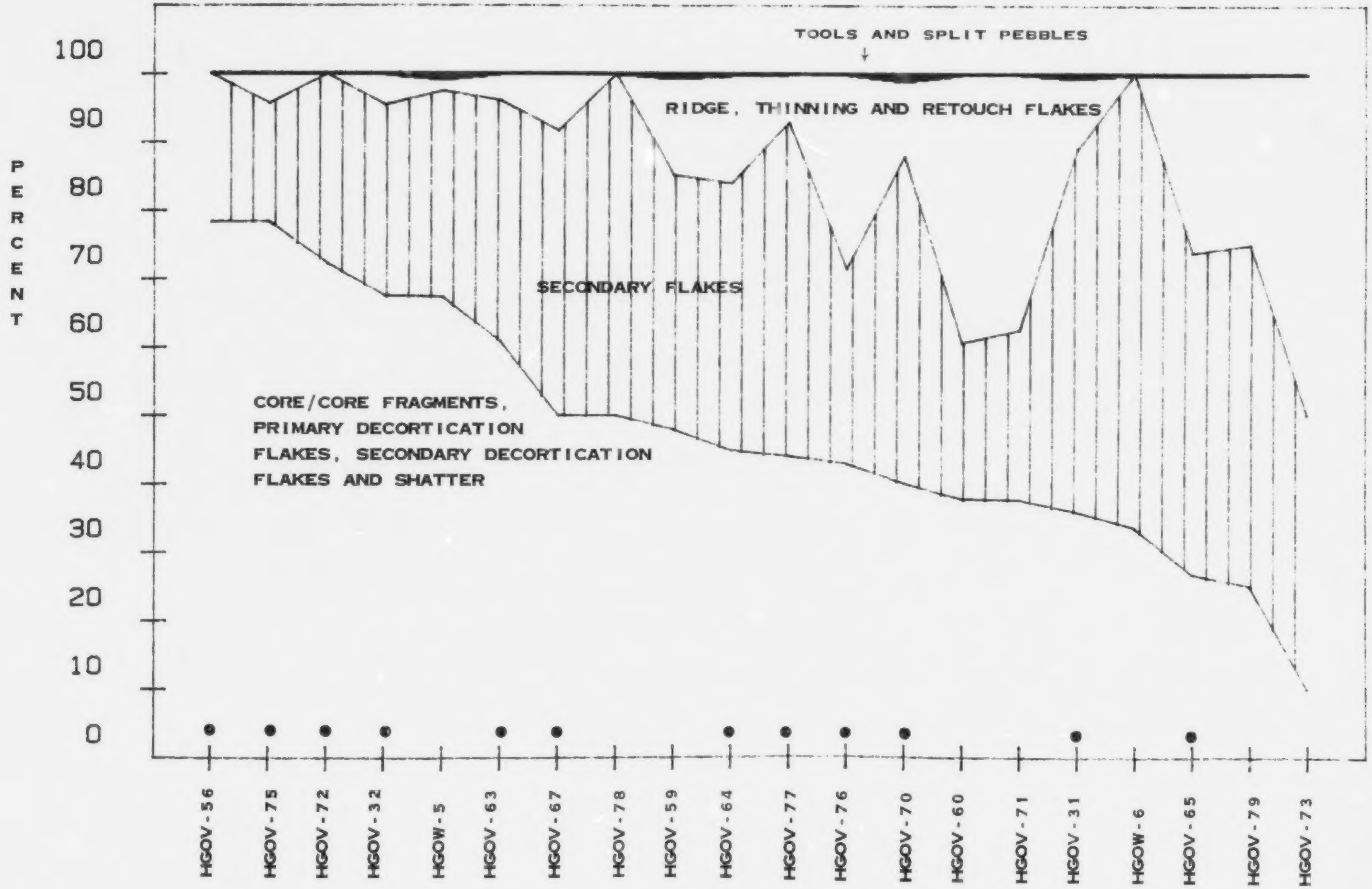
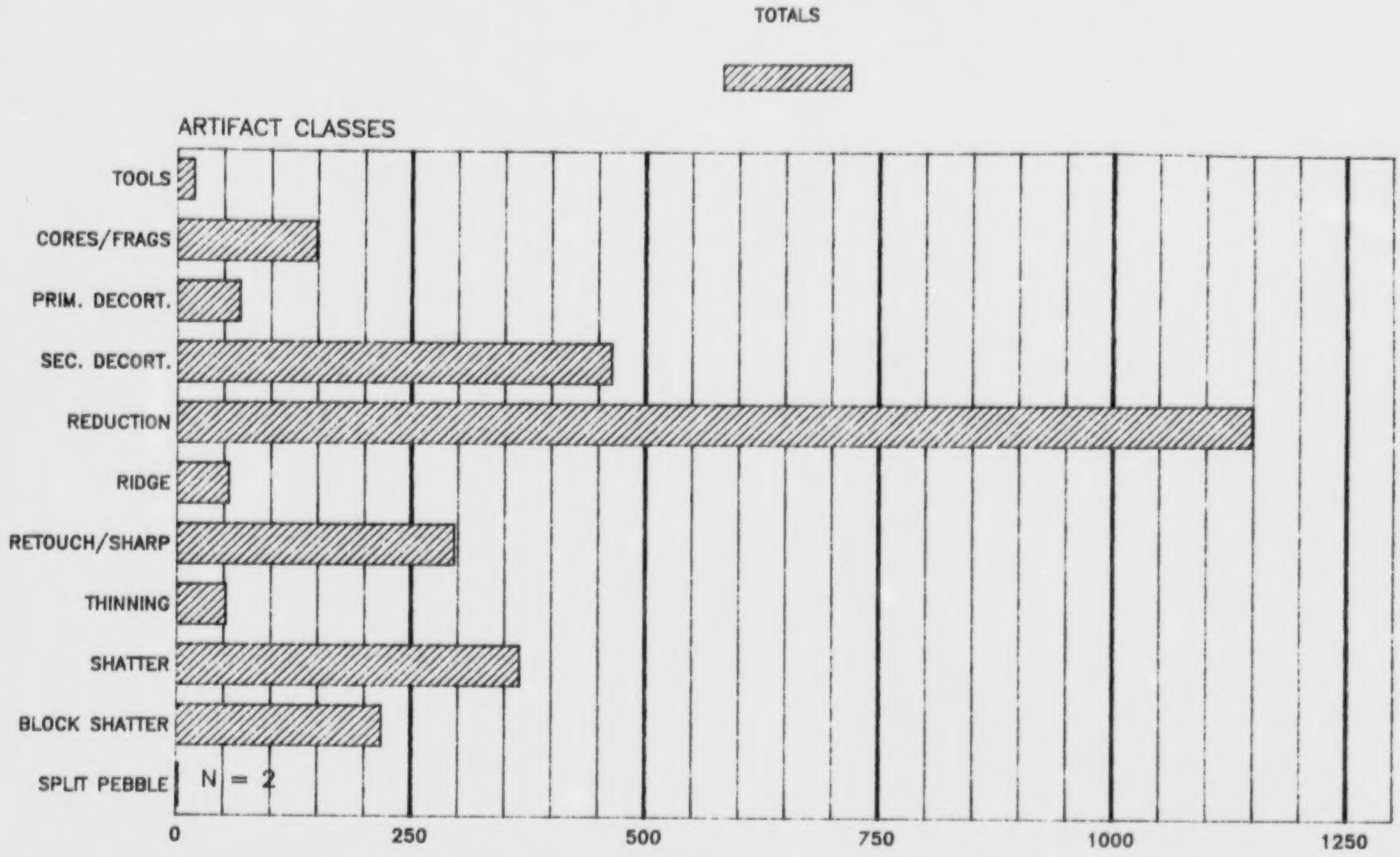


FIG. 9
SYNCRUDE CANADA LIMITED LEASE 22
ARTIFACT TOTALS ALL SITES



LIFEWAYS OF CANADA LIMITED 1984

FIGURE 10: EXPLANATION OF TABLES 1 - 3

TABLE 1

KEY: SITE AREA--ISOLATED FINDS REPORTED AS AREA OF SHOVEL TEST ($0.25M^2$)
ARTIFACT DENSITY--NUMBER OF ARTIFACTS DIVIDED BY AREA FOR SURFACE SITES AND THE NUMBER OF ARTIFACTS DIVIDED BY NUMBER OF TESTS MULTIPLIED BY FOUR FOR SITES IDENTIFIED IN SHOVEL TESTS.
TOOL DENSITY--AS ABOVE EXCEPT USING THE NUMBER OF TOOLS.
CONDITION--(0 = UNDISTURBED; 1 = PARTIALLY DISTURBED; 2 = DISTURBED)

TABLE 2

MEASURED VALUES APPEARING IN TABLE 1 WERE USED STRICTLY FOR THE PURPOSE OF CONSTRUCTING TABLE 2. THE RANGE OF VALUES (MINIMUM TO MAXIMUM) WERE SUBDIVIDED INTO FOUR POSSIBLE SCORES.

0 = ZERO TO THE AVERAGE VALUE LESS THE MINIMUM VALUE DIVIDED BY 2.
1 = AVERAGE VALUE LESS THE MINIMUM VALUE DIVIDED BY 2 TO THE AVERAGE VALUE.
2 = AVERAGE VALUE TO THE MAXIMUM VALUE LESS THE AVERAGE VALUE DIVIDED BY 2 AND ADDED TO THE AVERAGE VALUE.
3 = MAXIMUM VALUE LESS THE AVERAGE VALUE DIVIDED BY 2 AND ADDED TO THE AVERAGE VALUE TO THE MAXIMUM VALUE.

TABLE 3

THE SCORES ON TABLE 2 WERE USED AS A GUIDE ONLY FOR THE CONSTRUCTION OF TABLE 3. ARCHAEOLOGICAL VALUES ARE BASED ON THE SCORES OF TABLE 2, BUT ALSO REFLECT DATA ACQUIRED PREVIOUSLY FOR KNOWN SITES AND THE JUDGMENT OF THE PRINCIPAL INVESTIGATOR WITH RESPECT TO THE SCIENTIFIC POTENTIAL OF THE RESOURCE AND/OR OTHER FACTORS SUCH AS CONDITION, TYPES OF MATERIAL IDENTIFIED, CONTEXT, LANDFORM ASSOCIATION, ETC.

THE SIGNIFICANCE OF THE RESOURCE APPEARING IN TABLE 3 IS BASED UPON BOTH THE ABOVE AND BY A WEIGHTING OF THE DIMENSIONS APPEARING IN TABLE 1. ISOLATED FINDS, DISTURBED SITES AND/OR LOW ARTIFACT DENSITIES SERVED TO DIMINISH THE SIGNIFICANCE OF THE SITES. PREVIOUS INFORMATION AND/OR LANDFORM ASSOCIATION SERVED TO INCREASE THE SIGNIFICANCE OF THE SITE.

THE PRINCIPAL INVESTIGATOR CHOSE TO DISTINGUISH TWO LOCALES AT HGOW-5 AS THE CIRCUMSTANCES AND CONTEXT OF THE FINDS, ALTHOUGH IN CLOSE PROXIMITY, WERE SUFFICIENTLY DIFFERENT TO REQUIRE SEPARATE LISTINGS IN TABLE 1.

TABLE 1: SITE EVALUATION, SYNCRUDE CANADA LTD. LEASE NO. 22

| SITE | SITE AREA M$^2$ | NUMBER OF TESTS | POSITIVE TESTS | TOTAL ARTIFACTS | TOTAL TOOLS | DENSITY B.S. ARTIFACTS | DENSITY B.S. TOOLS | TOOLS/ ARTIFACTS | THICKNESS OF DEPOSIT | CONDITION |
|---|---|---|---|---|---|---|---|---|---|---|
| HGOV-55 | 0.25 | 3 | 1 | 1 | 1 | 1.33 | 1.33 | 1.0 | 5 | 2 |
| HGOV-56 | 0.25 | 8 | 1 | 23 | 0 | 11.5 | N/A | N/A | 10 | 2 |
| HGOV-57 | 0.25 | 7 | 1 | 5 | 1 | 2.86 | .57 | .20 | 5 | 2 |
| HGOV-58 | 10.0 | 6 | SURFACE | 5 | 2 | .5 | .2 | .4 | 2 | 0 |
| HGOV-59 | 0.25 | 5 | 1 | 58 | 0 | 46.4 | N/A | N/A | 15 | 2 |
| ● HGOV-59$_A$ | 20.0 | 5 | SURFACE | 238 | 2 | 11.9 | 0.1 | .008 | 5 | 0 |
| HGOV-60 | 0.25 | 5 | 1 | 61 | 0 | 48.8 | N/A | N/A | 10 | 2 |
| HGOV-61 | 0.25 | 9 | 1 | 2 | 0 | .89 | N/A | N/A | 5 | 2 |
| HGOV-62 | 0.25 | 9 | 1 | 1 | 0 | .44 | N/A | N/A | 3 | 2 |
| HGOV-63 | 450.0 | 12 | 4 | 225 | 0 | 75.0 | N/A | N/A | 45 | 2 |
| HGOV-64 | 600.0 | 16 | 7 | 444 | 1 | 111.0 | .25 | .002 | 15 | 2 |
| HGOV-65 | 25.0 | 9 | 3 | 650 | 1 | 288.89 | .44 | .002 | 10 | 2 |
| HGOV-66 | 0.25 | 5 | SURFACE | 1 | 0 | 4.0 | N/A | N/A | 5 | 0 |
| HGOV-67 | 25.0 | 8 | 2 | 12 | 0 | 6.0 | N/A | N/A | 10 | 2 |
| HGOV-68 | 0.25 | 5 | SURFACE | 1 | 0 | 4.0 | 0.1 | N/A | 5 | 0 |
| HGOV-69 | 10.0 | 0 | SURFACE | 2 | 2 | 0.2 | 0.2 | 1 | 5 | 0 |
| HGOV-70 | 2800.0 | 23 | 13 | 423 | 4 | 73.57 | 0.696 | .009 | 25 | 2 |
| HGOV-71 | 25.0 | 8 | 1 | 8 | 0 | 4.0 | N/A | N/A | 5 | 0 |
| HGOV-72 | 100.0 | 7 | 3 | 123 | 0 | 70.29 | N/A | N/A | 12 | 2 |
| HGOV-73 | 0.25 | 6 | 1 | 10 | 0 | 6.67 | N/A | N/A | 10 | 2 |
| HGOV-74 | 0.25 | 5 | 1 | 1 | 0 | .80 | N/A | N/A | 4 | 2 |
| HGOV-75 | 75.0 | 8 | 3 | 23 | 0 | 11.5 | N/A | N/A | 25 | 2 |
| HGOV-76 | 50.0 | 6 | 1 | 7 | 0 | 4.67 | N/A | N/A | 10 | 1 |
| HGOV-77 | 50.0 | 6 | 3 | 57 | 0 | 38.0 | N/A | N/A | 10 | 1 |
| HGOV-78 | 0.25 | 4 | 1 | 2 | 0 | 2.0 | N/A | N/A | 5 | 2 |
| HGOV-79 | 100.0 | 9 | SURFACE | 4 | 0 | 0.04 | N/A | N/A | 5 | 0 |
| HGOV-80 | 0.25 | 8 | 1 | 1 | 1 | .5 | .5 | 1.0 | 5 | 2 |
| HGOV-81 | 0.25 | 5 | SURFACE | 1 | 0 | 4.0 | 0.0 | N/A | 5 | 0 |
| HGOW- 4 | 0.25 | 3 | 1 | 1 | 0 | 1.33 | N/A | N/A | 5 | 2 |
| HGOW- 5 | 400.0 | 3 | 2 | 109 | 1 | 1.33 | 1.33 | 1 | 5 | 1 |
| ● HGOW- 5$_A$ | 50.0 | 2 | 2 | 10 | 0 | 20.00 | 0.0 | N/A | 5 | 0 |
| HGOW- 6 | 5.0 | 1 | SURFACE | 6 | 0 | 1.2 | 0.0 | N/A | 5 | 0 |
| HGOW- 7 | 0.25 | 1 | SURFACE | 1 | 0 | 4.0 | 0.0 | N/A | 10 | 0 |
| HHOW- 6 | 0.25 | 1 | SURFACE | 1 | 0 | 4.0 | 0.0 | N/A | 5 | 0 |
| HGOV-50 | 0.25 | 4 | 1 | 1 | 0 | 1.0 | N/A | N/A | 5 | 2 |
| HGOV-31 | 2500 | 42 | 11 | 189 | 1 | 18 | 0.095 | .005 | 10 | 1 |
| HGOV-32 | 200 | 7 | 1 | 43 | 0 | 24.57 | N/A | N/A | 5 | 1 |
| HGOV-29 | NOT ASSESSED |  |  | 96 | 2 |  |  | 0.021 |  | N/A |

● THE SUBSCRIPT A IS USED TO SEPARATE DIFFERENT LOCALITIES OF THE SAME SITE.

CONDITION 0 = DISTURBED 1 = PARTIALLY DISTURBED 2 = UNDISTURBED sites. Tables 1 and 2 provide the prehistoric descriptive and significance scores of resources identified in the course of this study. An equivalent scoring is based on a comparison of the individual site attributes taken independently (Table 2). The significance of known sites is described in Table 3. Each attribute is averaged and scores are given according to the site's standing. Prehistoric sites on Syncrude's Lease No. 22 include those of no significance (N=22), low significance (N=8), moderate significance (N=7) and high significance (N=2).

### 3.2.1 Sites of High Significance

Resources of high significance should be avoided in development. HgOv-29, the Beaver River Quarry Site, has previously been investigated, assessed and designated by the Provincial Government (Syncrude 1974, Losey 1980). The site is extensive and highly productive. The site is relatively unique and the source of significant information for resolving questions of methodology (i.e., determining the meaning of debitage assemblages) and substance (i.e., determining the period of quarry use and its role in the surrounding region). HgOv-54 is a reported pictograph site adjacent to HgOv-29. If present, it would be of considerable significance. The site was not relocated during this study.

#### 3.2.1.1 Descriptions

HgOv-29 (12VVU 625 300; Figures 2 and 4; Plates 9 and 29): The Beaver Creek Quarry Site (HgOv-29) was discovered in the course of archaeological studies on Lease No. 17 (Syncrude Canada 1973, 1974). The site area was reassessed in detail preparatory to the designation of the site area and the determination of areas available for the expansion of the existing borrow pit (Losey 1980). As it is a designated site, investigations at HgOv-29

TABLE 2: SITE VALUES, SYNCRUDE CANADA LTD. LEASE NO. 22

| SITE | SITE AREA | PERCENTAGE POSITIVE TESTS | NUMBER OF. . . . | | DENSITY. . . . . | | TOOLS/ ARTIFACTS | THICKNESS OF DEPOSIT | CONDITION | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | ARTIFACTS | TOOLS | ARTIFACTS | TOOLS | | | | |
| HGOV-55 | 0 | 3 | 0 | 2 | 1 | 3 | 3 | 0 | 3 | 15 |
| HGOV-56 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 3 | 7 |
| HGOV-57 | 0 | 1 | 1 | 2 | 1 | 0 | 0 | 0 | 3 | 8 |
| HGOV-58 | 1 | 0 | 1 | 3 | 1 | 3 | 1 | 0 | 0 | 10 |
| HGOV-59 | 0 | 2 | 1 | 0 | 2 | 3 | 3 | 2 | 3 | 16 |
| HGOV-59 | 1 | 0 | 3 | 3 | 3 | 0 | 1 | 0 | 0 | 11 |
| HGOV-60 | 0 | 2 | 1 | 0 | 2 | 0 | 0 | 1 | 3 | 9 |
| HGOV-61 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 5 |
| HGOV-62 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| HGOV-63 | 2 | 3 | 3 | 0 | 2 | 0 | 0 | 3 | 3 | 16 |
| HGOV-64 | 2 | 3 | 3 | 2 | 3 | 2 | 0 | 2 | 3 | 20 |
| HGOV-65 | 1 | 3 | 3 | 2 | 3 | 3 | 0 | 1 | 3 | 19 |
| HGOV-66 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 0 | 0 |
| HGOV-67 | 1 | 2 | 1 | 0 | 1 | 0 | 0 | 1 | 3 | 9 |
| HGOV-68 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 0 | 0 |
| HGOV-69 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | N/A | 0 | 2 |
| HGOV-70 | 3 | 3 | 3 | 3 | 2 | 3 | 1 | 2 | 3 | 23 |
| HGOV-71 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 3 | 7 |
| HGOV-72 | 1 | 3 | 2 | 0 | 2 | 0 | 0 | 1 | 3 | 12 |
| HGOV-73 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 3 | 7 |
| HGOV-74 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 5 |
| HGOV-75 | 1 | 3 | 1 | 0 | 1 | 0 | 0 | 2 | 3 | 11 |
| HGOV-76 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 2 | 7 |
| HGOV-77 | 1 | 3 | 1 | 0 | 2 | 0 | 0 | 1 | 2 | 10 |
| HGOV-78 | 1 | 2 | 1 | 0 | 1 | 0 | 0 | 0 | 3 | 8 |
| HGOV-79 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | N/A | 0 | 3 |
| HGOV-80 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 4 |
| HGOV-81 | 0 | 0 | 0 | 2 | 0 | 3 | 3 | N/A | 0 | 8 |
| HGOW- 4 | 0 | 3 | 0 | 0 | 1 | 0 | 0 | 0 | 3 | 7 |
| HGOW- 5 | 2 | 3 | 2 | 0 | 3 | 0 | 0 | N/A | 2 | 12 |
| HGOW- $5_A$ | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 4 |
| HGOW- 6 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 3 |
| HGOW- 7 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 2 |
| HHOW- 6 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | N/A | 0 | 1 |
| HGOV-31 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | N/A | 2 | 14 |
| HGOV-32 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | N/A | 1 | 5 |

TABLE 3 ARCHAEOLOGICAL SITE VALUE ORDERED BY SIGNIFICANCE

| ARCHAEOLOGICAL VALUES | SIGNIFICANCE | | | |
|---|---|---|---|---|
| | HIGH | MODERATE | LOW | NONE |
| **HIGH** | | | | |
| HGOV-29 | ● | | | |
| HGOV-31 | | ● | | |
| HGOV-50 | | ● | | |
| HGOV-54 | ●[4] | | | |
| HGOV-55 | | | | ●[1] |
| HGOV-59 | | | ●[2] | |
| HGOV-63 | | ● | | |
| HGOV-64 | | ● | | |
| HGOV-65 | | ● | | |
| HGOV-70 | | ● | | |
| HGOW-5 | | | ●[2] | |
| **MODERATE** | | | | |
| HGOV-32 | | | | ●[2] |
| HGOV-51 | | ● | | |
| HGOV-56 | | | ● | |
| HGOV-57 | | | | ●[3] |
| HGOV-58 | | | | ●[1] |
| [5] HGOV-59$_A$ | | | ● | |
| HGOV-60 | | | ● | |
| HGOV-61 | | | | ●[3] |
| HGOV-67 | | | | ●[3] |
| HGOV-69 | | | | ●[2] |
| HGOV-71 | | | | ●[2] |
| HGOV-72 | | | ● | |
| HGOV-73 | | | | ● |
| HGOV-74 | | | | ●[1] |
| HGOV-75 | | | ● | |
| HGOV-76 | | | | ●[3] |
| HGOV-77 | | | ●[3] | |
| HGOV-78 | | | | ●[3] |
| HGOV-80 | | | | ●[1] |
| HGOV-81 | | | | ●[1] |
| **LOW** | | | | |
| HGOW-4 | | | | ● |
| HGOV-62 | | | | ● |
| HGOV-66 | | | | ● |
| HGOV-68 | | | | ● |
| HGOV-79 | | | | ● |
| HGOW-6 | | | | ● |
| HGOW-7 | | | | ● |
| HHOW-6 | | | | ● |

[1] ISOLATED FIND [2] DISTURBED [3] LOW DENSITY OR COUNT OF MATERIAL

[4] NOT RELOCATED [5] SUBSCRIPT A IS USED TO SEPARATE DIFFERENT LOCALITIES OF THE SAME SITE.

were curtailed in favor of testing areas beyond the mapped perimeter. The existing distribution of material is extensive and clearly delineated in tree throws, test pits, and shovel tests. Testing in the course of this study was focused on the terrace edge to the east of the site and between the site and HgOv-31 to the southwest (discussed below). Thirty thousand four hundred five artifacts have been previously recovered from testing and excavation at the site (Priegert 1984:personal communication).

HgOv-54 (12VVU 627 306; Figures 2 and 4; Plate 10): A pictograph site, HgOv-54 was identified and assessed in 1981 during the course of a proposed pipeline survey (Ronaghan 1981c). The site consists of a "square panel above the north bank of Beaver Creek, ca. 100 m west of cutline for Range 10/11 and ca. 750 m west of Highway 963" (Ronaghan 1981c:Site Inventory Form). A series of attempts to relocate the pictograph site focused on an outcrop of Beaver River at the reported location. The area examined, on three occasions, consisted of a series of rock panels on an exposed edge of the terrace, the first outcrop to the west of the CU Engineering Ltd. right-of-way. No evidence of the pictograph was observed. There remains room for doubt as to whether the panel is associated with another, west facing exposure adjacent to a tributary of the Beaver River. For our purposes we defer to the original assessment. The site is located within the boundaries of the designated area for HgOv-29.

### 3.2.2 Sites of Moderate Significance

Resources of moderate significance should normally be avoided in development, but impacts can, should it be necessary, be mitigated by means of scientific study. The value of these sites do, however, require that investigation be directed towards the resolution of significant research problems.

Here, resources classified as being of moderate significance include a series of quarry/workshop/campsites located within the general vicinity of HgOv-29 and, presumably, serving a similar function. These sites (HgOv-31, 50, 51, 63, 64, 65 and 70) are characterized by relatively dense concentrations of cultural material as demonstrated in the course of shovel testing. Similarly, this density is maintained over relatively large areas, although not to the degree of HgOv-29. In this context any research question which could be resolved by investigation of the designated Beaver River Quarry Site could likely be equally served by investigation of the above sites, and it is desirable to bring those sites not presently lying within the boundaries of HgOv-29 under the management of the Province, provide for active protection measures, and stipulate conditions for research. For this reason their avoidance is recommended. Given the relatively restricted distribution of these sites, such a measure should be relatively easy to implement. Prehistoric sites of moderate significance are described below.

### 3.2.2.1 Descriptions

HgOv-31 (12VVU 621 305; Figures 2 and 4; Plate 11): This site was initially identified in the course of the Historical Resources Impact Assessment of proposed upgrading of Highway 63 (Sims 1976a). A total of 3,597 artifacts were previously recovered from the exposed edge of the highway embankment. In the course of the 1984 study, both sides of the highway were examined and an extensive program of shovel testing was carried out to the east of the highway. In excess of 65 shovel tests were placed adjacent to the highway and on two lower terraces. Positive finds were restricted to areas 100 and 125 metres from the terrace edge as measured along the length of the road and approximately 20 to 25 metres from the road, between 150 and 200 metres from the terrace edge and 10 and 30 metres east of the road; and on a second terrace 50 metres to the east of the road and between 50 metres and 120 metres from the edge as measured along the road. Eleven tests were positive, but these were complemented by artifactual material in the same areas within tree throws (N=6). One hundred eighty-eight artifacts were recovered from shovel tests. Although a large part of the site was effectively removed by highway construction, it appears that a significant body of material is still located in undisturbed areas of the site to the east of the highway. Artifactual material is confined to the zone between 16 and 25 cm and is associated with orange coloured sands above a zone of similar sands containing pebbles. The site lies in a mixed wood Boreal forest setting above the Beaver River to the southwest and within the boundaries of HgOv-29. No further work is necessary.

HgOv-50 (12VVU 630 321; Figure 4; Plate 12): This site was identified by Gryba (1979) in the course of highway surveys in the north during 1978 and tested the following year (Gryba 1980b). Then, testing consisted of 16 square metres of excavation and yielded evidence for two or three cultural components. The upper component consisted of an historic assemblage including a flesher, shell casings and similar material. Two, possibly mixed, lower components contained corner notched points, bifaces, scrapers and an abundance of lithic debitage. Gryba reports that the construction of the Alsands Bridge would not destroy the major area of the site (ibid. 55).

HgOv-50 was re-examined during the course of this study. Original test units were observed alongside the right-of-way south of the bridge. The identified area of the site, however, has been, more or less, partially deforested. Areas to the south of the bridge are protected, but currently are being used for camping. The previous testing of the site precluded a necessity to assess it further. However, a series of tests were placed on the river embankment ledge to the south of the reported site area. In the vicinity of the area used for unregulated riverside camping and near a previous test, a single shovel test yielded a split chert pebble from approximately 25 cm below surface. All other shovel tests along the ledge between the bridge and the area of HgOv-7 were negative. In its present location the site appears to be protected from extensive subsurface disturbance.

HgOv-51 (12VVU 622 310; Figures 2 and 4; Plate 9): HgOv-51 was identified in the course of studies of HgOv-29 by Losey (1980). The site area forms a triangular area between the existing borrow pit and the borrow pit access road. Assessment was limited to an examination of tree throws and confirmation of the site's presence. No material was collected. The site appears to be a continuation of HgOv-29 in a westerly direction. In conjunction with a second defined loci of HgOv-29 located to the southwest of the borrow pit, HgOv-51 makes up a part of the complex of sites which can reasonably be said to constitute the Beaver Creek Quarry (Figure 2). This site is of moderate value and significance.

HgOv-63 (12VVU 627 304; Figure 2 and 4; Plate 13): This site is located on the south bank of the Beaver River on a small point of a terrace which projects northward into the valley of the river approximately 100 metres to the east of a small tributary located on the opposite side of the river. Although identified in a shovel test, material was also observed to be eroding out of the escarpment edge. Four shovel tests laid out in a linear (NW-SE) fashion proved positive. Seven additional tests located on both sides of this line proved negative. The site is estimated to be 30 by 15 metres in size. Material (225 flakes of Beaver River Sandstone) was recovered from depths ranging between 20 and 55 cm. Material was associated with both the upper buff/grey sands and the lower orange sands. The site area lies within the designated boundaries of HgOv-29.

HgOv-64 (12VVU 623 304; Figure 2 and 4; Plate 14): This site is located north of HgOv-32 and on the south side of Beaver River opposite the confluence of an unnamed tributary. The site area covers the higher terrace, a slope, and a lower terrace. Of the 16 shovel tests employed in assessment, seven were positive. The positive tests were associated with the edge of the upper terrace, the lower terrace and the upper portion of the slope. The latter area includes the two highest density tests--196 and 269 flakes, respectively. The site area is estimated to be approximately 20 by 30 metres and is covered by spruce/aspen. Material was recovered from between 10 and 25 cm depth in the medium-grained, grey sand matrix. The site area lies within the designated boundaries of HgOv-29.

HgOv-65 (12VVU 624.5 304.5; Figure 2 and 4; Plate 14): This site is located on the east side of the peninsular terrace above a low boggy area on the south side of the Beaver River. The site area, approximately 5 by 5 metres, is located approximately 15 metres from the terrace edge and 50 metres south of HgOv-70. Three of nine shovel tests yielded artifactual material. Six hundred forty-nine artifacts were recovered from medium-textured grey sand between 20 and 30 cm below surface. The site appears to be a small lithic workshop. The site area lies within the designated boundaries of HgOv-29.

HgOv-70 (12VVU 624 305; Figure 4; Plate 14): This site is located on a high peninsular feature on the south side of Beaver River approximately 60 m east of HgOv-64 and opposite the confluence of an unnamed tributary. The site area consists of spruce, aspen, wild rose and a variety of berry bushes. The site is approximately 70x40 m in size. Artifactual material was recovered from 13 of 23 shovel tests. Four of the 423 artifacts were tools, including a scraper, two biface fragments, and a retouched/utilized flake. Artifactual material was recovered from medium-textured, buff-grey sands at depths between 10 and 25 cm. One test, however, yielded artifactual material from 38 cm below surface. The site area lies within the designated boundaries of HgOv-29.

### 3.2.3 Sites of Low Significance

Resources of low significance are those which have been assessed as having moderate archaeological values and are of relatively high quality. Resources of this nature are of sufficient value to require some level of study in the course of mitigating impacts but are not of sufficient quality/value to designate or avoid during development. In general, resources classified thusly offer the potential for serendipitous finds of chronological and functional diagnostics and/or other materials. In this context, mitigation of impacts requires at least a minimum level of study. This may include the recovery of the entire assemblage from locationally circumscribed sites to the sampling of more extensive sites. The description of such sites provides a reservoir of data to which general research questions may be addressed. As the significance of these sites is, in part, mitigated by their redundancy, it may also be appropriate to exploit such resources in the course of investigating specialized problems which require sacrificing certain kinds of data for particular ends.

Seven prehistoric sites within the lease are of low significance but of moderate or high archaeological value. These sites (HgOv-56, 59, 60, 72, 75, 77 and HgOw-5) are characterized by a minimum of one relatively dense shovel test. The dense shovel test is complemented by either a sparse distribution over a larger area or the presence of second concentrations. In the case of sites of moderate and high significance, recall that the material density is complemented by extensive distributions. This is the result of repeated use of a circumscribed area for activities which naturally result in large, but circumscribed, areas of material concentration. Sites classified here as being of low significance are characterized by discontinuous distributions of high density and are the result of less frequent use. The concentrations here can be shown to be less than 10 m, and likely less than 5 m, in diameter on the basis of the shovel testing program. In all instances, additional concentrations within a circumscribed area are suspected, and the site boundaries are probably co-terminus with specifiable features.

The density of material recovered from the highest positive tests at these sites provides a relative rank of their potential. The densely populated tests include 127 specimens (HgOv-72), 61 specimens (HgOv-60), 58 specimens (HgOv-59), 55 specimens (HgOv-77), 23 specimens (HgOv-56), and 19 specimens (HgOv-75). All of these site areas are undisturbed. HgOv-59, however, does border on a borrow pit, on the edge of which a second concentration of material was identified (HgOv-59a). There, over a distance of 50 cm by 10 cm a total of 236 specimens were recovered. That collected area represents the highest density observed over a distance of approximately 20 m along the edge of a borrow pit.

HgOw-5 is classified as being of moderate archaeological value but low significance. There, 118 specimens were collected from a disturbed surface on the slopes of a well-defined knoll, the top of which was not disturbed. The material remains represent the total amount of observed material within a diameter of approximately 2 m of four defined concentrations. A considerable amount of material was observed between these concentrations over a relatively large area surrounding three sides of the knoll. In this context, HgOw-5 illustrates the suspected nature of most of the sites described as being of low significance. The observed distribution also draws attention to the futility of shovel test assessments on such sites in the Boreal forest. Had HgOw-5 been undisturbed, it is likely that perhaps only one in ten shovel tests would have been positive and that this ratio would have been achieved only if select areas of the feature had been targeted.

### 3.2.3.1 Descriptions

HgOv-56 (12VVU 627 306; Figure 2 and 4; Plate 9): This site is located on a prominent spruce/pine covered remnant knoll surrounded by wetlands in an old oxbow of Beaver River. The site is located southeast of HgOv-29 on the north side of Beaver River. Twenty-two Beaver River Sandstone flakes and a core fragment were recovered from one of eight shovel tests at the apex of the triangularly shaped knoll above an eroded escarpment. The specimens were recovered from a sandy matrix just above red sands at a depth of approximately 20 cm.

HgOv-59 (12VVU 613 298; Figure 4; Plate 15): This site was originally located in a shovel test on the west edge of a prominent knoll situated about 200 m south of the tributary of Beaver River on which HgOv-58 is located. The south edge of the knoll is truncated by an existing borrow pit. Four additional tests on the knoll failed to yield additional material. Along the edge of the borrow pit, however, a small, but very dense concentration of material was noted over a distance of approximately 5 metres. Material was found in the cut over a maximum distance of 20 metres. Fifty-eight specimens were recovered from the single shovel test. Two hundred fifty-six specimens were recovered from a 50 cm segment of the exposed cut at its densest point (Plate 16). Two tools were collected from the exposed cut at large. These include a scraper and a biface fragment. The knoll and surrounding area were covered in pine.

In addition to the archaeological assemblage, the knoll exhibited evidence of historic use (e.g., hearth, tables, racks, etc.) (Plate 17).

HgOv-60 (12VVU 613 302; Figure 4; Plate 15): HgOv-60 is also located on the pine covered terrace south of the unnamed tributary of Beaver River. The site is located northeast of HgOv-58 and HgOv-59. Fifty-eight flakes were recovered from the original test. A single flake was recovered from one of four additional tests within appproximately 5 m of the first. The matrix from which the specimens were recovered consists of unconsolidated sands. The site appears to be representative of a class of small activity specific sites and is of comparative value for understanding larger sites characterized by mixed assemblages.

HgOv-72 (12VVU 623.5 301; Figure 4; Plate 14): This site is located on the south side of Beaver River approximately 300 metres east of Fort MacKay Road on a high terrace. The site area lies approximately 30 metres from the escarpment edge and 70 metres south of HgOv-32. The lithic scatter consists of 105 Beaver River Sandstone flakes plus 18 core fragments recovered from three of seven shovel tests. The site is approximately 10 by 10 metres. Artifacts were recovered from buff-grey sands at a depth ranging from 12 to 25 cm below surface. The site area is characterized by typical aspen/spruce vegetation.

HgOv-75 (12VVU 628 309; Figure 4): This site is located east of HgOv-29 and north of Beaver River at the northwest corner of an abandoned oxbow. The site lies on the edge of a high terrace in an area characterized by spruce/aspen woodlands. Twenty-three artifacts were identified in three of eight shovel tests. Nineteen of the specimens were from a single test. The artifactual material was found dispersed in the deeper occurring orange sands, between 20 and 50 cm below surface.

HgOv-77 (12VVU 620 302; Figure 4): This site is located on the outside escarpment of a slight meander of the Beaver River adjacent to a cart track west of the river, and west of MacKay Road. Three of five shovel tests were positive. Fifty-seven artifacts were recovered from a single test between 20 and 30 cm below surface in buff-coloured sands. Each of two other tests contained a single Beaver River Sandstone flake. The local setting consisted of typical spruce/aspen woodlands with an understory of wild rose, mosses, and Labrador tea.

HgOw-5 (12VVU 591 355; Figure 4; Plate 18): This site is located at the extreme northern end of a clear cut timber lease north of a series of small beaver dammed lakes. The site is associated with the southern and western margins of a well-defined knoll. The top of the knoll is, more or less, undisturbed while a large area of the southern margins was scraped. The western margin is disturbed along the course of a vehicle track. The undisturbed top of the knoll and a similar knoll to the west were shovel tested with negative results.

The surficial distribution of artifacts did not appear to be disturbed with respect to their horizontal location. In this context the existing distribution of artifacts provides a clear picture of the nature of prehistoric sites within the region. The site consists of a series of discrete clusters of material. Four well-defined clusters of material were present, as well as a sparse distribution of material along the west margin of the site. The latter may be due to displacement caused by bulldozer activities. One hundred eighteen Beaver River Sandstone flakes were recovered from the clusters which ranged in size from 3 x 3 metres to 10 x 5 metres. Shovel tests on clusters of material northwest of the undisturbed area and to the west failed to yield additional material. Shovel tests on the two clusters along the southern margin of the feature each yielded small numbers of artifacts, approximately 20% of the number found on the surface over the same area. Due to the sandy nature of the sediments, it was impossible to determine whether disturbance continued to the depth of the recovered specimens, approximately 15 cm. Undisturbed sediments at the top of the knoll revealed a sequence of organics (0-5 cm), grey/brown sands (5-10 cm) and orange sands (lower than 10 cm). The surrounding area consisted of a mature spruce forest with moss and lichen floor.

### 3.2.4 Sites of No Significance

Resources of no significance include prehistoric sites of high, moderate and low value. Sites of moderate value include HgOv-32 and HgOv-73. In the former case its value lies in existing collections and an apparent distribution of material. This value, however, is mitigated by the nature of the distribution. The observed material lies on an eroding slope and is highly disturbed from natural causes. In the latter instance HgOw-73 appears to be of moderate significance, but its significance is mitigated arbitrarily on the basis of the density criteria adopted in this program (i.e., greater than 10 artifacts being required from a single test).

Sites of moderate and low archaeological value include HgOv-57, 58, 61, 67, 69, 71, 73, 76, 78, 79 and HgOw-6. These sites represent small finds of generally less than five artifacts in any one test, surface finds of fewer than 5 artifacts in disturbed areas, or other mitigating factors.

Other sites of no archaeological significance include HgOv-55, 62, 66, 68, 74, 80, 81, HgOw-4, 7 and HhOw-6. These sites are represented by isolated finds of no archaeological value and, therefore, no significance to development.

Sites of no archaeological significance do not require further study.

### 3.2.4.1 Descriptions

HgOv-55 (12VVU 632.5 303; Figure 4; Plate 19): This site consists of an isolated Beaver River Sandstone retouched/utilized core. The site is located to the southeast of a prominent knoll adjacent to Beaver River. The site lies on the southwest slope at the southwest end of a kame-like feature located adjacent to a well-defined kettle bog. The site area is covered in aspen. The specimen was recovered from a depth of approximately 20 cm below the surface. The matrix from which the specimen was recovered consists of an orange sand (B horizon).

HgOv-57 (12VVU 631 318; Figure 4; Plate 20): This site is located on a limestone ledge approximately 3 metres above the Athabasca River. The site is located immediately north of a cleared working area associated with the construction of the C.U. Engineering Limited pipeline (Ronaghan 1981c). The four Beaver River Sandstone specimens, three core reduction flakes and one block shatter, were recovered from the buff-coloured sands just below the root mat and above the orange sands at a depth between 10 and 20 cm. Material was recovered from only one of the seven tests excavated.

HgOv-58 (12VVU 611 300.5; Figure 4; Plates 15 and 29): This site is located on the south side of a tributary of Beaver River. Three Beaver River Sandstone flakes were found exposed in a sandy vehicle track across the terrace of the tributary. Six negative tests were excavated adjacent to the vehicle track in the surrounding pine covered flats. Approximately 50 m to the northeast of the site area, a 5 ft. by 5 ft. test unit was observed, however, no known prehistoric sites have been recorded within the area.

HgOv-61 (12VVU 610 302; Figure 4; Plate 21): This site is located approximately 100 metres upstream and on the north side of the tributary on which HgOv-58 is located. The site lies approximately 50 metres from the tributary on a ledge formed by an outcrop. Two Beaver River Sandstone shatter specimens were recovered from one of nine shovel tests in an area measuring approximately 20 by 20 metres. The surrounding vegetation includes poplar, spruce and alder.

HgOv-62 (12VVU 608 299.5; Figure 4; Plate 22): This site consists of a single Beaver River Sandstone core fragment recovered from one of nine shovel tests on a point of land overlooking an unnamed tributary of Beaver River. The site lies in an area of spruce/aspen on the north side of the tributary west of HgOv-61. Material was recovered from unconsolidated sands at a depth of approximately 20 cm.

HgOv-66 (12VVU 632 307; Figure 4): This site is located on the north side of Beaver River on a high escarpment edge consisting of limestone rock outcrops. The site area is relatively flat, vegetated with spruce and aspen, and associated with a major east-west break in slope. The site consists of an isolated piece of Beaver River Sandstone block shatter. The specimen was recovered from approximately 20 cm in a medium-textured, grey, unconsolidated sand. Five additional shovel tests proved negative.

HgOv-67 (12VVU 621.5 290.5; Figure 4): This site is located on the west bank of Beaver River approximately 100 metres to the north of the first meander scar of the existing (disturbed) channel. The site is located on a narrow bend below the high terrace of the river. Two of eight shovel tests yielded artifactual material. Twelve specimens of Beaver River Sandstone were recovered from grey sands between 10 and 20 cm below surface. The site is approximately 10 metres in diameter and situated in an area of aspen/spruce.

HgOv-68 (12VVU 602 347; Figure 4): An isolated find, HgOv-68 is located on the north escarpment of a feeder drainage channel of the lower reach of the MacKay River. The site is situated adjacent to where a cutline intersects the terrace edge. The site locale also lies to the east of a clear cut timber lease and west of the abandoned route of the MacKay Road. The specimen, a core of Beaver River Sandstone, was recovered from between 10 and 20 cm in a medium-textured buff/grey sand. Aspen and spruce with an understory of lichen, moss, wild rose and Labrador tea characterize the site area.

HgOv-69 (12VVU 611 340; Figure 4): This site is associated with a gentle sand ridge bounded by a black spruce bog. Two retouched/utilized flakes were recovered from a road exposure adjacent to a transmitter station west of the abandoned route of MacKay Road. No additional tests were excavated because of the large area of exposure.

HgOv-71 (12VVU 613 346; Figure 4): This site is located on the east side of the existing MacKay Road in an area which was bulldozed as part of the highway setback. Artifactual material was originally noted on the surface in exposed sediments. Eight shovel tests were placed in undisturbed deposits on an aspen covered high terrace of the Athabasca River. One of the tests proved positive and consisted of a single flake from 10 cm. Seven flakes were recovered from the surface.

HgOv-73 (12VVU 601.5 346; Figure 4): This site is located approximately 50 metres east of the confluence of two unnamed tributaries of the lower MacKay River. The site is associated with a small ridge on the south side of the east-west drainage. One of six shovel tests were positive. Ten Beaver River Sandstone flakes were recovered from less than 20 cm in the buff/grey sands.

HgOv-74 (12VVU 600 340; Figure 4): This site consists of an isolated find identified in one of five shovel tests. The material was recovered from approximately 15 cm in buff/grey-coloured, unconsolidated sands. The site area is located on a low ridge on the east side of a north-south tributary of the lower reaches of MacKay River. The site is approximately 400 metres south of the confluence with another unnamed tributary. The isolated find consisted of a split pebble.

HgOv-76 (12VVU 620 303; Figure 4): This site is located in a tree throw on a high inside escarpment on the west side of Beaver River and west of MacKay Road. Debitage was recovered from a road cut and two of six shovel tests. The site area was characterized by a mature stand of spruce. The site area is undisturbed.

HgOv-78 (12VVU 618 298.5; Figure 4): This site is located west of SR963, a cutbank, and Beaver River on a small spur of land formed by the intersection of the escarpment with a drainage. One of four shovel tests yielded two Beaver River Sandstone flakes from a depth of 18 cm in a medium brown sand. The site area is characterized by a mature stand of spruce underlain by thick mosses.

HgOv-79 (12VVU 621 332; Figure 4; Plate 23): This site is located adjacent to Fort MacKay Road (Highway 63), approximately 2 km north of its junction with the Alsands Road. The site is located on the east side of the road on a prominent terrace edge overlooking a bog to the east. The site is approximately 40 metres from the road. Three Beaver River Sandstone flakes and one piece of black unidentified shatter were recovered from the disturbed surface. Nine shovel tests in undisturbed areas to the east of the find were negative. The undisturbed area adjacent to the road is characterized by black and white spruce stands with wild rose and Labrador tea forming the understory.

HgOv-80 (12VVU 611 303; Figure 4; Plate 24): This isolated find is located in an area of pine flats immediately east of a cutline which joins an unnamed tributary of Beaver River with a large borrow pit to the north of the tributary and west of MacKay Road. The single quartzite block shatter (utilized) was recovered from approximately 20 cm depth in unconsolidated sands. The site area is associated with a ridge-like feature which trends at right angles to the unnamed tributary.

HgOv-81 (12VVU 617 279; Figure 4; Plate 25): This site is located on the south side of the upper reach of Beaver River and east of the Syncrude tailings pond. The site lies adjacent to a large disturbed area west of Highway 63. A single Beaver River Sandstone flake was recovered from the edge of the exposed escarpment. Five shovel tests, on the undisturbed sediments of a saddle-like feature truncated by the escarpment, were negative.

HgOw-4 (12VVU 539 332; Figure 4): This site is located on the north side of a peninsular feature on the west side of MacKay River on the top of a high terrace. The site is located just to the east of the isthmus at its narrowest point. A single Beaver River Sandstone secondary decortication flake was recovered from a shovel test in a Dover soil of a white, ashy/silty sand. The shovel test, to a depth of approximately 25 cm, did not encounter the gravels which are more or less typical of many of such tests in this soil type. Two additional shovel tests also failed to yield cultural material.

HgOw-6 (12VVU 594 341; Figure 4; Plate 26): This site consisted of four Beaver River Sandstone flakes and one pepper-and-salt quartzite flake in two areas astride a vehicle track near the south end of the clear cut area as described above. The site area was found to be associated with a low rise to the west and the terrace of a small unnamed tributary of MacKay River. A shovel test on the larger of the two finds revealed orange sands to a depth of greater than 30 cm. The A (organic) and B (grey/brown sands) were apparently removed by bulldozer activities. The surficial location of the cultural material cannot, therefore, be associated securely with any of the zones present. The surrounding area is characterized by a mature stand of spruce.

HgOw-7 (12VVU 592.5 339.5; Figure 4; Plate 27): This site consists of an isolated Beaver River Sandstone flake found in a vehicle track near the south end of the clear cut area and less than 200 metres southwest of HgOw-6. The site lies west of an unnamed tributary and approximately 75 metres north of the cutline which delimits the timber cut area. Shovel tests adjacent to the vehicle track and closer to the tributary failed to reveal additional cultural material.

HhOw-6 (12VVU 546 368.5; Figure 4): This site consists of an isolated quartzite primary decortication flake recovered from a vehicle track where the track intersects a low terrace above MacKay River. The terrace edge is located on a bend of MacKay River on the west bank at the north edge of the study area. The specimen was located high up on the bank of the vehicle track in eroding sediments and, for this reason, is assumed to be cultural. Shovel tests were placed on the terrace flats to the east of the vehicle track. These failed to yield cultural material.

HgOv-32 (12VVU 624 304; Figures 2 and 4): The Big Bend Site (Sims 19/5) was re-examined and shovel tested in conjunction with a detailed examination of this peninsular area on the south side of Beaver River. During this study, artifactual material was observed eroding out of the river terrace at the reported site location. Seven shovel tests were placed within the designated site area. Only one was positive, yielding a small sample of Beaver River Sandstone (N=7). Thirty-six specimens were also collected from the eroding bank. It would appear that this concentration of the archaeological material has been severely affected by the continuous erosion of the river bank.

## 3.3 HISTORICAL RESOURCES

Archaeological inventory of historic aged sites was carried out in conjunction with the search for prehistoric materials.

The significance of historic sites is determined primarily on the basis of their association with important events, personages, places and thematic periods of provincial development. The above, for example, are associated with the exploration and development of industry in the Oil Sands region and with the fur trade. The aim of historic site management is to identify and provide protection for sites of potential public interpretation.

Significance of historic sites is determined by the Historic Sites Service. Within the Oil Sands Region, the Historic Site Service has previously designated the Bitumount Oil Plant near Fort MacKay as being of historic significance (Alberta Culture n.d.). In addition it has identified the following potentially significant sites:

- The Athabasca Oil Ltd. Wells near Fort MacKay
- The Alcan Oil Company Wells near Fort MacKay
- The International Bitumen Wells near Fort MacKay

- Von Hammerstein's Wells near Fort MacKay
- Pierre au Calumette
- Berens House, and
- The Fort MacKay Post

A total of 143 shovel tests were excavated along the MacKay River between the confluence and Alsands Bridge, searching for Berens House. This was complemented by a detailed visual examination of the area for evidence of historic use and structural remains. If present, the post should be evidenced by structural remains including, for example, refuse pits, a cellar, and the remains of a chimney. Although considerable evidence of historic use was observed (e.g., tin cans, refuse, trails, and cut wood), no evidence of the post was identified.

### 3.3.1 Standing Structures (Figure 4)

Five sites containing structures were identified during the course of the study. All of the sites appear to have been related to fur trapping activities and all but one are abandoned. Of the four abandoned sites, three are cabin sites and one is limited to a basal structure of logs used for a wall tent. Associated refuse at all of the sites suggests a relatively recent age (i.e., post-World War II). As such sites are common and of little historic value, they were not recorded with the Historic Site Service. The sites are described below.

### 3.3.1.1 Descriptions

Syncrude H1 (12VVU 514 306): This site is located on the north side of a tributary of the west bank of MacKay River, approximately three kilometers north of the south boundary of the study area and one kilometer west of MacKay River. The site is located 75 m east of a cutline appearing on available 1:50,000 NTS mapping. The structural remains consist of three- and four-log high walls with no apparent doorway. The logs are of small diameter. A stove, mattress, ladder and associated refuse were found scattered about the margins of the camp area. The location is associated with a low portion of the tributary which is beaver dammed. Round nails and glass baby food containers, among the refuse, suggest relatively recent occupation. The camp is interpreted as being the base of a wall tent camp of recent age and associated with trapping activities. The site is of no historical value and no further study is required.

Syncrude H2 (12VVU 510 283, Plate 28): This site is located approximately two kilometers west of MacKay River and one kilometer north of the south boundary of the study area. The site is located on the north side of a beaver dammed channel and lies on a well-drained feature with less than one metre of relief. The surrounding area is covered in spruce. The site consists of a complex including a cabin, a raised cache, and the basal structure for a wall tent at one location; and two basal wall tent structures located approximately 50 m to the east. The cabin (abandoned) is characterized by notched corners, sill-on-ground, a log roof, a southeast-facing door and window, and two additional windows on the northeast and southwest. Logs are chinked with both insulation and moss. The structure is approximately 4.5 m sq.

Syncrude H3 (12VVU 4/1 371): This site is located several hundred metres to the east of a tributary of the Ells River. The site lies within a narrow area of pine away from the waterbody. The cabin (abandoned) was constructed with notched corners, sill-on-sand, and with a peaked log roof held aloft by a centre beam. The cabin structure is approximately 4 m sq. and 2 m in height. The structure exhibits a west-facing door and north- and south-facing windows of small dimensions. Associated recent refuse is present along with a variety of other constructions (e.g., drying rack, chopping blocks, etc.).

Syncrude H4 (12VVU 521 389): This site is located on the northeast bank of the southeast flowing tributary of MacKay River. The site lies on a low bench of the tributary at the base of a moderate terrace. The cabin, approximately 4.5 m sq., is constructed of squared notched logs. Associated features include a tent frame, refuse piles and a dog or storage structure. The cabin was in good condition and was observed to be locked, suggesting current seasonal use.

Syncrude H5 (12VVU 619 308): This site is located on the north bank of a tributary of Beaver River immediately west of SR963. The cabin is approximately four by four metres and two metres in height. The corners are notched.

None of the historic sites identified in the course of the project are considered to be significant.

## 3.4 RECOMMENDATIONS

No plans have been set for development of Syncrude Canada Ltd. Lease No. 22. Given this fact and the rapid changes in archaeological methodology, our changing perspectives, the constant addition of new information, and the evolution of public policy, it would be premature to establish the scope and methods of site specific impact mitigation. In general, however, it is possible to establish a strategy for mitigating impacts. These are discussed below.

Paleontological remains of potential significance are found in formations which underlie the study area and outcrop along the Athabasca and lower MacKay rivers. Their value is primarily scientific with the remains offering the key to interpreting the depositional environments. A specific concern involving the

Devonian formation is moot, as oil extraction would not involve excavation of these materials. Concerns for fossiliferous zones in or above oil bearing formations have yet to be expressed. Mitigation of impacts to these materials would necessarily involve the development of an encounter strategy as such resources cannot feasibly be inventoried prior to development. Unique and/or other significant fossil assemblages could be conserved by means of establishment of a monitoring program during the operating lifespan of the mine, should it be developed. These and similar issues should be addressed in consultation with the Tyrrell Museum of Paleontology prior to actual development.

It is recommended that all significant prehistoric sites be avoided wherever possible. These sites are known to be associated with Beaver River east of Highway 63 and with unnamed tributaries of the MacKay and Beaver rivers where they intersect the escarpment between the Clearwater and Dover plains. Sites of high and moderate significance are associated with the former (Figure 2). The remainder of significant sites are associated with the latter. In our opinion, should the latter areas be developed, the three sites of concern--HgOw-5, HgOv-59 and HgOv-60--should be investigated further. Such investigations should be carried out in two phases. The first should involve exploratory study designed to further delineate the sites, their contents and the nature of their distribution (whether clustered or continuous). The second phase of the study would involve, minimally, a comprehensive excavation of a sample of such clusters as are present.

Known sites of historic age within the study area are of no provincial significance and do not represent a concern to potential developments. The site of Berens House, based on existing information, is likely located outside the study area. Given the significance of this site, it is recommended that a more comprehensive study be mounted to confirm its location. This would involve extensive archival documentation of extant documents held in, for example, the Hudson's Bay Archives. Based on this information, one would be in a better position to establish the need for and appropriate strategies of site discovery and protection.

## 4. ARCHAEOLOGICAL CONTRIBUTIONS

The objectives of archaeological research within the Oil Sands region, in contrast to the objectives of historical resource management, have followed a variety of diverse paths. Although most of the studies, particularly smaller projects, have limited themselves to the discovery of new prehistoric sites, a number of important directions have also been pursued.

Attempts to determine the physical associations of prehistoric sites as a means of predicting site locations have been a major focus of study (Syncrude Canada Ltd. 1974, Ronaghan 1981a, Ives 1982). In this regard, sampling methodology has also been of continuing interest. Conaty (1980), Ronaghan (1982), McCullough and Wilson (1982) and others have each bent their studies to include and/or emphasize probabilistic sampling as a means of predicting prehistoric site locations and densities.

In the most general sense archaeologists have known that prehistoric sites are associated with major rivers, tributaries, major lakes, elevated topographical features and other well-drained lands. It is further assumed that the density of prehistoric sites is controlled by the presence of game, fish, lithic quarries and other resources, as well as by seasonal distribution of such resources.

Each of the major project areas examined within the Oil Sands Region to date--the Syncrude Lease Numbers 17 and 22, the Canstar Project, and the Alsands Project area--are characterized by relatively unique configurations of terrain and hydrological features. Similarly, each is known to exhibit different patterns of prehistoric site distribution. Of the three project areas cited, the Alsands Project area exhibits the widest and densest distribution of prehistoric sites. These are associated with the Athabasca River, the Muskeg River, and in particular, with areas of low relief--knobs and ridges--totally surrounded by muskeg. It is reported that in the latter case, the distribution of sites takes the form of a fan pointed towards the vicinity of Cree Burn Lake (Ronaghan 1982).

Within the Canstar Project area prehistoric sites are primarily associated with the Athabasca River (N=11), tributary rivers (N=9) and lake edges or sinkholes (N=20). It is reported, however, that these and the remainder of the known prehistoric sites are generally associated with the edge of wetlands. With respect to the drainage associations, this pattern differs from that of the Alsands Project area. However, with respect to their association with the edge of wetlands, the two patterns are similar. To some degree this pattern of wetlands association is characteristic of Syncrude as well.

The two patterns of archaeological site association--the wetlands terrestrial interface and the quarry--are characteristic of the two poles of exploitive patterns outlined by McCullough and Wilson (1982) in their 'diffuse economic model' of prehistoric exploitive patterns. The model, a generalization of historic and ethnographic data, suggests that fisheries served as focal points of prehistoric occupation. Site densities within this framework would vary as a distance function around such focal points. Outlying sites would represent task specific encampments, primarily hunting camps, and would be associated with 'edge areas'. Intermediate to these two major poles of exploitation would be special use areas such as quarries, birch stands and berry patches (ibid.). Hypothetically then, the density of prehistoric sites is directly proportional to the productivity of a particular area in terms of one or more resources. From a practical archaeological standpoint, the model is only useful to the degree that the archaeologist can map the productivity of the Boreal forest. From an explanatory point of view, the model is only as good as its ability to account for known distributions and/or to explain cultural change.

The model does, of course, account for the distribution of prehistoric sites within the general vicinity of the quarry sites, the valley of the Athabasca River and along the tributaries of the Athabasca. It does not account for the differences in site distribution between, for example, Syncrude and Alsands unless one assumes that with respect to the density and distribution of moose, the Alsands Project area is of significantly higher productivity. If so, this explains the absence of prehistoric sites within the hinterlands of the Syncrude lease. To our knowledge, however, contemporary data does not support this contention. Alternatively, we can conclude that the Cree Burn Lake vicinity was subject to significantly greater use in the prehistoric past than was the Beaver River Quarry.

With respect to the density of prehistoric sites, the number of prehistoric sites within certain areas of Syncrude (Beaver River) and within Alsands (Cree Burn Lake), the distribution of sites is aberrant as a result of the presence of quarries and/or suspected quarries. The density of sites around the two quarries differs markedly. The Beaver River Quarry is discrete and surrounded by a high number of prehistoric sites of unusual artifactual density. The density of sites around the quarry, however, falls off rapidly. The Cree Burn Lake locality, on the other hand, exhibits an extensive distribution of artifactually dense prehistoric sites. One would suspect that the latter has been in use for considerably longer than the Beaver River Quarry and/or that the Cree Burn Lake locality consists of a more extensive distribution of Beaver River Sandstone outcrops.

Detailed lithological study of Beaver River Sandstone also represents a major focus of archaeological study (Fenton and Ives 1982, Ives and Fenton 1983, and Fenton and Ives 1984).

Underlying this research is the fact that the distribution of an identifiable lithic resource is critical to the understanding of trade patterns, contact, and the movement of human groups. As will be seen in the following discussion, the secure identification and tracking of Beaver River Sandstone throughout northeastern Alberta provides basic evidence for far-flung cultural relationships. In the following sections, these basic research directions are examined with particular emphasis on setting the valley of the Athabasca, and the Syncrude Lease in particular, in provincial perspective.

In 1972 a prehistoric quarry was discovered on the Beaver River within Syncrude Lease No. 22 (Syncrude 1974). The material from this quarry was later found to be similar to materials which are found to dominate every artifact assemblage within the valley of the Athabasca between Fort McMurray and the Peace-Athabasca Delta (McCullough and Wilson 1982). The agenda of lithic research over the following decade consisted of attempts to identify the geological provenience of the material, to map the distribution of outcrops, to explain disparate interpretations and distributions, and to otherwise clarify the position of the raw material.

Beaver River Sandstone, originally referred to as Beaver Creek Quartzite, was originally attributed to Cretaceous-aged deposits overlying the top of Devonian-aged deposits (Syncrude 1974). Later, Mallory (1980) suggested that the material should be attributed to the Upper McMurray formation. In 1981, Reeves suggested that the material was most likely associated with the basal Wabasca member of the Clearwater formation (Ronaghan 1982). By 1982 the status of the material had been modified from quartzite to sandstone, and was determined to be associated with the Pre-McMurray (Fenton and Ives 1982, McCullough and Wilson 1982). Further research has led to the determination that the material was associated with the upper unconformity of the Lower

McMurray formation (Fenton and Ives 1984).

To explain the far-flung distribution of this material, McCullough and Wilson (1982) invoked the concept of a dispersal envelope resulting from glacial activities. They suggest that the density of this material in prehistoric sites throughout the region can only be explained by local exploitation of detritus contained within the glacial outwash and drift. However, Ives and Fenton (1983) are conservative in this regard and suggest that no evidence for glacial float exists and that, in fact, the distribution of Beaver River Sandstone is highly limited. In this context the distribution of Beaver River Sandstone is totally explainable as a function of cultural patterns of movement and/or trade.

Substantive contributions are limited to a few significant excavations of rare archaeological site types. In this context, the Beaver River Quarry (HgOv-29) and the Bezya Site (HhOv-73) within the Alsands Project area stand out (Syncrude Canada Ltd. 1974, Reardon 1976, Ronaghan 1981a and Le Blanc 1984). The first site is a quarry site, the mined material of which is found to be distributed over a relatively large area within the region. The last is a microblade site which is unique in northeastern Alberta. Microblades are small, thin, parallel flakes (<1.0 cm) removed from specialized cores and inserted in wooden or bone shafts. This technology is associated with cultures of northwestern North America and ultimately with Asian cultures of the last 10,000 years. Both are important to the understanding of the prehistoric record.

In addition to these, a number of more limited test excavations have been undertaken at sites of moderate and low significance including HhOv-50, HhOv-71, HhOu-16 and sites in the vicinity of the Cree Burn Lake locality (Gryba 1980a, Ronaghan 1982, Head 1979b, Mallory 1980). With the exception of the Bezya Site, these resources have been extremely resistant to interpretations due to a lack of formal tool types (e.g., spear points, bifaces, arrowheads and scrapers) in collections recovered. One of the primary reasons for this resistance is that quarry related sites contain low frequencies of formed tools, a basic ingredient of interpretation. Similarly, quarry related sites share with the typical shallow site of the northern forests a complexity which stems from a mixing of differing collections. Unstratified prehistoric sites may represent a number of occupations by different prehistoric cultures.

Paramount to understanding a region's culture history is the reconstruction and interpretation of the prehistoric record. This is done by means of continued re-assessment of the data available which accompanies the reporting of most major projects. Donahue (1976b), Pollock (1978), Ives (1981b) and McCullough and Wilson (1982) are typical of this genre. The last study stands out to the degree that it attempts to provide an explanatory model for understanding the dynamics which underlie known prehistoric site distributions.

In the following section an overview of the prehistoric record for the Athabasca Valley is provided. As excavations within the valley are extremely limited, even the most tentative of reconstructions requires that we discuss the prehistoric record within a regional framework. This comparative approach ultimately leads to conflicts with previous interpretations which suggest strong relationships to the Plains or other surrounding regions (e.g., Pollock 1978). In this review of the data, which has involved an examination of many of the specimens reported to be Plains related, a strictly cultural/historical approach has been employed. In this manner, the relative uniqueness of the culture history of the Boreal forest can be better appreciated. However, in order to establish this uniqueness, it is necessary to compare and contrast the regional record with that of surrounding regions including the Plains, Mountains, Parklands, Lakelands and Barren Lands.

Similar to past reconstructions (e.g., McCullough and Wilson 1982), this overview emphasizes the limitations of the forest and the relationship between the distribution of resource rich areas and the subsistence and landuse patterns of the forest occupants. However, unlike previous interpretations, explanations for cultural change are sought from within, rather than without, the Boreal forest. Such changes are viewed as a product of an unique history of peoples and environments rather than as a product of outside cultural influences.

Whether or not this interpretation stands will depend on whether or not future facts can be incorporated within the model. For the present, however, the model appears to better account for what is already known. A chart (Figure 11) of the culture history is provided to assist the reader in the following review.

## 4.1 PREHISTORIC-CULTURAL-HISTORICAL OVERVIEW

Culture history and landuse patterns of the Fort McMurray Region were strongly influenced by the limiting conditions of the Boreal forest homeland. The open grassland plains to the south offered vast herds of migratory bison, an abundance of other game, and ease of travel. Similarly, the open forests, grassland valleys, and alpine slopes of the Rocky Mountains offered diversified game resources (including bison, sheep, and caribou, fowl and fish) as well as relative ease of travel within and between the valley systems. In contrast to these areas, the Boreal forest was much more restrictive. Small and localized herds of woodland caribou, for example, in the Birch and Caribou Mountains and localized herds of wood bison were found concentrated in the more productive grasslands/parkland enclaves of the forest margins. The principal game throughout the vast reaches of the forest--from the Lakeland, from Cold Lake to Lesser Slave Lake, the Peace River Country and the highly productive Peace-Athabasca Delta and Slave River District--was the moose. The largely solitary and nonmigratory nature of this animal strongly structured the native settlement and subsistence patterns, and along with the seasonal nature of other food resources--fish and fowl--placed upper limits not only on the overall size of the Native population which inhabited the areas, but on the size of the seasonal encampments and groups who lived together.

Fishing and fowling were important to the Native peoples. In those parts of the forest where productive fish lakes occurred--the Lakelands along the southern fringes of the forest, Wabasca, Lac Claire and Lake Athabasca; or lakes in the highlands such as Gardiner and Gregoire, for example--the fish provided a critical food resource which was exploited during warm weather, during seasonal spawning runs, as well as in winter. Prehistoric settlement focused on these lakes; e.g., Lac La Biche (McCullough 1982), Lesser Slave (LeBlanc 1981), Calling Lake (Gruhn 1981), North Wabasca (Sims 1981), Gregoire (Pollock 1977b) and lakes in the Birch Mountains (Ives 1981a). Fishing, however, was not confined to lakes but also occurred along the rivers, particularly at favored locales where spawning and migration runs could be intercepted. Like fish, the migratory waterfowl were also exploited in their spring/summer nesting grounds. During the molting season they were particularly easy to exploit. Where large numbers of waterfowl were known to concentrate; e.g., Lesser Slave and the Peace-Athabasca Delta; they also served as an important seasonal source of food. Thus, the seasonal distribution and geographic concentration of game animals, fish and fowl controlled both the seasonal round and the focus of Native activities with the result that certain areas of the Boreal forest region became the focus for Native settlement early in its history and appear to have remained so throughout prehistoric time.

The Boreal forest's vast expanses of forest and muskegs were essentially impenetrable on foot except in winter. This factor controlled how, where and in what season of the year people moved. Inequalities in the distribution and seasonal abundance of game, fowl and fish, taken together with seasonal restrictions on travel, help explain the patterning of Native settlement and resource use employed in prehistoric times.

The peoples of the forest were Canoe Indians, utilizing the lakes, rivers and portages to move throughout the area, both along the major routes known to and used by the fur trade (for example, the Clearwater, Athabasca, Lesser Slave and Peace) as well as the smaller rivers and lake systems (the Christina or Wabasca). A very efficient form of travel, the canoe not only transported larger loads than possible on foot (except with large numbers of pack dogs - in the forest), but greater distances could be travelled each day. Camps in areas between the seasonal hunting, fishing and fowling grounds could be further apart and much smaller as they were very temporary--a few nights at most. Often little, if anything, remains of these camps as they would often be on the adjacent river banks and later washed away as the rivers moved in their courses.

Where necessary, travel in the forest, both summer and winter, involved the use of pack dogs in summer and sled dogs in winter. The use of dogs, however, requires a significant investment by Native peoples in time and energy in the production of dog food and consequently, a higher dependence on stable and predictable resources by people who use dogs as an integral part of their transport system in forested environments. This is in sharp contrast to the Plains where meat for the dogs was easily obtained, and in the Dog days (before the horse was obtained in the mid-1700s from tribes to the south) the Native people depended on dogs for transport of their tipis, possessions, and meat and hides from the hunt.

The conditions of the Boreal forest, both in food distribution and getting around, (in contrast to the Plains/Parklands to the south, the Foothills/Mountains to the southwest, as well as the Barren Grounds to the north) favored a smaller number of Native peoples, dispersal for much of the year in small camps, and a landuse pattern geographically focused on the most productive and accessible areas within the mosaic of the marshes, lakes and rivers, enclaves of aspen parkland and grassland, and the more open highlands of the Boreal forest.

The archaeological record of the Boreal forest (Ives 1980) reflects this pattern, and while intensive archaeological work has only begun in the last ten years, studies to date indicate that many areas of the forest, away from the lakes, rivers and highlands, are archaeologically barren while those in accessible and rich resource areas are quite rich in archaeological sites. Among these is the Lower Athabasca below Fort McMurray, a review of which we will turn to, following a brief discussion of another resource which is important to life in the forest as well as elsewhere--stone. The nature and distribution of stone for making tools in the Boreal forest is essential to our understanding of the culture and landuse history of the Fort McMurray area as well as the visibility of prehistoric sites in the archaeological record.

The Native people of the Americas, prior to the introduction of metal containers, implements and weapons during the fur trade, relied primarily on stone to manufacture durable tools used in hunting, killing, butchering and processing of animals and animal products. Although bone as well as wood (if hard woods were available) were used for tools (bone harpoons and spear heads, for example, among the Native Athabascans of the forests for the last 1,500 years), tools of these perishable organic materials do not preserve well in acidic forest soils and consequently, are rarely found, particularly in older sites.

The stone sought and used by Native peoples consisted of various kinds of rocks and minerals which are fine-grained and contain a high silica content. These are hard, hold an edge and are easily modified. These materials could be obtained from certain bedrock outcrops or as float stones in gravels and some glacial deposits. Glacial lake deposits, primarily stone-free clays form a veneer mantle over much of the Boreal forest, thus covering the underlying stony tills left by the glaciers. These in turn mantle the bedrock. Some tills may contain cobbles and pebbles of quartzite (metamorphosed sandstone) and/or chert (a fine-grained sedimentary rock, originally deposited as concentrations or "nodules" in beds in limestones) scooped up from underlying gravels and conglomerates over which the ice advanced. Tills outcrop along some rivers and streams as well as along the borders of the highland areas where large blocks gradually slump and erode, exposing chert and quartzite pebbles and cobbles in cuts and on surface. These eventually are deposited in streams and river gravels. Gravels were also deposited as outwash by the glaciers as they melted and by the major rivers and streams at the end of the ice age ca. 10,500 years ago. These deposits are localized, and together with the chert pebbles and quartzite cobbles from recent river and stream gravels are the most widely distributed and used source of material in the forest.

Bedrock sources of high quality material for stone tool manufacture are extremely rare in the Boreal forest. Limestones outcropping on the Peace, Slave and Athabasca contain both nodules and beds/bands of chert (Stevenson n.d.). These were sometimes used in the lower Peace and Slave and probably also on the Athabasca. However, much of this material in the Athabasca appears to be of very poor quality. The Peace Point cherts are of good quality and were a preferred source which was sought and traded on the Lower Peace, Slave and Athabasca. In the Upper Peace, cobbles and bedrock outcrops of a distinctive, black silicious chert occur. These were sometimes used in the Lower Peace.

Vein quartz and quartzites outcrop in the Canadian Shield, east of the Slave River and on the north side of Lake Athabasca. These were also used as sources for chipped stone tools in those areas; however their quality is generally poor and they were not traded any distance.

Distinctive "pepper-and-salt" and grey-brown quartzite artifacts appear in abundance in sites on the Athabasca and in the Birch Mountains. Although no research has been done, the abundance there suggests that the quartzites are being obtained from a nearby cobble source which is yet to be located, either a preglacial quartzite lag gravel which often caps the old erosional surfaces represented by hills such as the Birch Mountains or conglomerate beds in the underlying Cretaceous-aged bedrock. In both instances, the sources are likely associated with the margins of the hills.

Another important source of material for the region, described briefly elsewhere in our report, is the Beaver River Sandstone source on the Athabasca. First discovered in 1972 during the archaeological survey of Lease 17 (Syncrude 1973) it was then thought to be restricted to a single source--the Beaver River Quarry from which a sample was excavated in 1973 by Syncrude (1974). It is now known to occur also as a bedrock source on the east side of the Athabasca in the vicinity of Cree Burn Lake (Ronaghan 1982) and the Alsands Lease. This localized occurrence is unique to the region. It is the only locale on the Clearwater/Lower Athabasca system where major bedrock quarry/workshop areas have been found, and it is the only area in which a major silicious bedrock formation outcrops or occurs as float (Ives and Fenton 1983).

Very significant in a regional context, the Beaver River Sandstone quarry/workshops throw light on an unique aspect of Native resource/landuse patterns, that of procurement and manufacture. Normally, the procurement of material was a dispersed activity as material was generally scarce, conserved when obtained, and used to exhaustion. The archaeological visibility of sites on the Athabasca/Clearwater which reflect the normal pattern of material acquisition is low as artifacts are few in number in such sites, reflecting the small groups occupying them (perhaps only one to three families) and the brief nature of their occupation (a few nights at best). The quarries were similarly exploited by small groups, but repeatedly through time. At the quarries, materials are abundant and reflect the waste material left in the search for only the best stone by the stone workers. This selectivity resulted in very high archaeological visibility, and we should not misinterpret the archaeological record at the quarry/workshops as representing large seasonal encampments, as some workers have done (McCullough and Wilson 1982; Donahue 1976b:123).

The Beaver River Sandstone, derived from bedrock, was the major source of raw material for stone tool manufacture in the area. A large amount of material was sifted and reduced to obtain the highest quality stone for artifact manufacture. As a consequence, reduction/manufacturing sites are extremely common and "highly visible" in the archaeological record as compared to elsewhere along the Athabasca and in the forest where such material was absent.

In sum, the Boreal forest offered limited but varied resources in both food and stone. Combined with the impositions posed by the environment on travel, the forests gave rise to a distinctive

Native culture and landuse history which contrasts sharply with the Plains/Parklands, the Mountains or the Barren Lands. We now turn to the origins of this pattern and the history of the Boreal forest.

## BEGINNINGS

Native peoples have occupied the Americas for at least the past 40,000 years. Early sites, dating to and before the last ice age (older than 22,000 years), have been found in South and North America, both below and to the northwest of the Continental and Cordilleran ice sheets.

Archaeological study of the early sites indicates these early Native Americans were already well adapted to diverse environments, ranging in South America from cold temperate forests in the foothills of Southern Chile to the high Andes, the arid scrub "desert" of northeastern Brazil and savannah grasslands of coastal Venezuela.

South of the ice sheet in North America, Native peoples were living on both the Californian coast and the interior of the Great Basin--then a well-watered steppe grassland rather than a desert. They also lived on the plains of eastern Colorado and the forests of Appalachia. The Rocky Mountains and Columbia Plateau were also occupied by hunters, fishers and fowlers living in a parkland steppe. Contemporaneously in the central Yukon, peoples adapted to the unique steppe-tundra of the last ice age were present. Living under extremely dry and cold conditions, these people were proficient hunters of the bison, horse and mammoth which then roamed the steppes and valleys of the Yukon and Alaska. Their cultural traditions, as expressed in their stone tools, were part of a pattern known as the "Beringian" which extended far west into Siberia and south to China (Reeves 1985).

In contrast, the peoples south of the ice had quite different cultural traditions suited to the many and diverse environments in which they lived. It was not until near the end of the last ice age, around 10,500 years ago, that technological contact was established again with the north. Native peoples probably once occupied the Boreal forests of northern Alberta and the Mackenzie prior to the last ice advance, but for the most part their sites were ground away by the advancing ice. It is only in the most exceptional circumstances, where preglacial sediments or surfaces have been preserved, that evidence of these earlier peoples will ever be found and then probably only in the western Peace River country where some lands lay in front of the ice and above the old lakes.

The ice in Northern Alberta advanced to the western edge of the Plains, reversing river drainages and impounding in front of it large glacial lakes, the melt waters from which flowed through a narrow icefree corridor first to the south, and by 13,000 years ago, into the Mackenzie as the ice wasted back from the Mackenzie and Richardson Mountains, reopening the northern river systems. As the ice wasted back towards the Shield, minor stillstands and local advances occurred.

One, in the Lower Athabasca, saw a surge of ice move up valley to the old Fort Hills vicinity. As ice levels lowered, the size, shape and locations of the glacial lakes and the drainages changed. The history, as well as dating of these events, is as yet unknown, since little geological study or dating of these surface features and deposits has been done in this vast region.

How long the ice stood at its maximum westerly position is presently unknown, but, based on radiocarbon dates elsewhere, it probably started to disintegrate around 14,000 years ago. Over the study area, the ice advanced southwesterly by glaciers originating from an ice center in Keewatin, covering the Caribou and Birch Mountains, terminating ca. 20,000 years ago near the towns of Peace River and Fort Nelson along the western border of the Plains. Large proglacial lakes--such as Glacial Lake Peace, Liard and later McConnell which enclosed the Caribou Mountains--formed along the wasting ice front. Initially they drained to the south into the Saskatchewan-Missouri proglacial system. By 17,000 years ago they drained north into the proglacial Peace. By 11,000 years ago the high levels of McConnell had drained and the Mackenzie River was established in its present channel. The ice at that time lay along the edge of today's Slave River, connecting Glacial Lake McConnell--part of which occupied the Peace and Athabasca Lowlands via the Athabasca and Clearwater channels with Glacial Lake Agassiz, a large proglacial lake which occupied Saskatchewan and Manitoba south of the ice sheet. The glacial Peace and Athabasca rivers, charged with vast quantities of melt water from the wasting Cordilleran Mountain and Continental glaciers, built a delta out into this large glacial lake--the largest freshwater delta of its kind known in the world.

As the lake levels lowered, successive beach lines formed around the shores, and dune systems began to develop in the fine glacial silts and sands. The delta continued to build until around 10,000 years ago, when lowering of the ice to the northeast resulted in the separation of Glacial Lake McConnell into two smaller lakes--Glacial Lake Great Slave and Glacial Lake Athabasca. The Athabasca and Peace River systems began to incise the old glacial age delta, beginning the formation of the modern delta. Upstream, thick gravel fill terraces were deposited in the vicinity of Fort McMurray which prograded into the glacial delta.

A fossil elephant bone from a mammoth or mastodon (too broken up to tell) was found in the Great Canadian Oil Sands gravel pit in this terrace, 100 ft. above today's river level. Although not yet dated by radiocarbon, the fossil can date no later than around 10,200 years ago, the time at which mammoths and mastodons finally became extinct in North America and Eurasia. The Great Canadian Oil Sands find is very important as it indicates animal and plant communities had established themselves by this time in the Athabasca lowlands.

The nature of the Athabasca valley's environment at this time--whether it was a Boreal forest which immediately occupied the valley upon recession of the ice and glacial lakes or whether a birch shrub tundra community was the colonizing vegetation--has important implications for the kinds and numbers of game animals which would initially be present and consequently the adaptive patterns of the first Native peoples to occupy the lands.

The vegetation of these early times is poorly known for the lowlands, as a study of the vegetation through analysis of fossil pollen from a lake/bog core has not been undertaken. Some clues, however, do exist. During the initial development of the Syncrude plant and mine, a 4 m deep peat bog was excavated. Underneath 3 m of peat was one metre of pond sediments, included in the lowest levels of which were large amounts of wood, including large logs of spruce. A date of 10,000 +/- 320 years was obtained on some wood fragments, and one of 11,400 +/- 245 on fresh water shells from the same level. These data indicate a spruce forest was present in the lowlands by 10,000+ years ago. Did a shrub tundra proceed it? It may or may not have (O'Neil 1984:personal communication).

The vegetation of the nearby uplands is better understood. A 7.85 m long sediment core was extracted from Eaglenest Lake in the Birch Mountains by the Archaeological Survey of Alberta (Vance 1984). The first 2.25 m consisted of sand and clay with only a few pollen grains and no organic material suitable for radiocarbon dating. At 5.07 m below the surface below the top of the core, a date of 10,740 +/- 150 years was obtained. Pollen increases dramatically, analysis of which indicates a scrub poplar steppe tundra--characterized by willow, grass, and sages and some tundra plants--was present. This is immediately succeeded by a forest dominated by spruce and birch. About 7,300 years ago, based on radiocarbon dating, pine and alder appear in the profile, and the forest assumes an essentially modern composition. The abundance of grass and sage in the early levels suggests a relatively cool/dry climate during these early times. The Birch Mountain core is similar to most other cores to the west which show a similar sparse steppe-tundra with scrub poplar being replaced by a spruce forest around 9,800 years ago, in the western Peace-Athabasca drainage. Further south and west the steppe-tundra was better developed and more productive. In contrast, in the territories, a birch shrub land appeared around 10,500-10,000 BP after the initial communities and was replaced by spruce between 9,000 and 8,700 BP.

While the pollen profile suggests an initial open vegetation community, a profile from Moore Lake near Cold Lake, Alberta paints a different picture. Analysis of a 9 m core (with a basal date of 11,300 +/- 170) indicated a mixed wood boreal forest, comprised of poplar, birch and spruce, was established at the time the lake began to receive sediment (Schweger et al 1981). This suggested to the palynologists that the boreal forest at Moore Lake, like elsewhere to the southeast, had colonized the glacial till or drift surfaces which mantled a stagnating ice mass that was wasting away in place, protected and buried by its own insulating drift. Therefore, Boreal forests were present at the time of the lake's formation, and pollen was incorporated into the first lake sediments.

Together, these data suggest the lower Athabasca could then have been colonized either by an open steppe-tundra which gave way to a spruce forest by around 10,500 years ago, a history similar to the Birch Mountains, 400 m higher in elevation than the valley; or by Boreal forest similar to that recorded at Moore Lake, 375 km to the south. The presence of spruce logs at the bottom of the peat bog studied on the Syncrude Lease indicates a spruce forest of some type was present by that time. A local pollen profile is required to clarify the early and later vegetation history of the lowlands. The elephant fossil, until identified to species, does not clarify our understanding of the environment. Mammoths were grazers/browsers and, along with horse and bison, occupied open parkland savannahs. Mastodons were browsers/grazers which occupied (along with caribou, moose and other woodland animals) the Boreal lake forests existing in late glacial times around the glacial lakes.

## EARLY PEOPLES (8,500 B.C. - 5,500 B.C.)

The late glacial hunters of North America were adapted to the plains, forests and lakeside habitats. They belonged to a period of time, called by archaeologists the Early Prehistoric Period, dating between 10,000 B.C. and 5,500 B.C. The cultures of this time are characterized by use of throwing and stabbing spears. The first people known to occupy the lands along the borders of the wasting continental ice belonged to a technologically sophisticated culture known to archaeologists as Clovis, named after a town in New Mexico where the distinctive spear points were first found in the 1920s in association with a mammoth kill. The long, thin, triangularly shaped points were made by a distinctive stone flaking technique. They were thinned for hafting to ivory or bone spear foreshafts, by removal of long, thin flakes from the bases into which the shafts were then fitted. The result was a "fluted point", the hallmark of Clovis and technologically related cultures of late glacial times. South of the ice on the plains, Clovis peoples hunted bison, horse and mammoth as early as 12,000 years ago, while in the forested east, they hunted mastodon and caribou and fished for Atlantic salmon along the eastern seaboard.

At the same time in the mountainous west, another culture, characterized by a different technology (using more crudely made, lanceolate-shaped points), existed. Known as the Old Cordilleran culture, these peoples ranged throughout the mountainous west, south into Mexico and Central America. They were diversified hunters and fishers and practiced a different lifestyle than Clovis. They also spread northward as the ice receded from British Columbia, eventually meeting the Beringian peoples who were at that time spreading southward from the unglaciated regions of the Yukon.

The Alberta Eastern Slopes and Plains, based on present evidence, were first occupied by Clovis complex peoples. Their distinctive points have been found in plowed fields and gardens as far north as Cold Lake and the Peace River country. In the Eastern Slopes, buried Clovis sites of this culture have been excavated in the foothills west of Calgary (Gryba 1983), in the Bow Valley within Banff National Park (Fedje 1984), and at a rock shelter at Charlie Lake near Fort St. John (Fladmark et al 1984). At the last site, the Clovis occupation (radiocarbon dated to 10,500 years ago) was found 4 m below surface. Butchered bison, arctic hare and other small game were also found. Analysis of the fauna indicates the Fort St. John area at that time was a cold but productive grassland steppe.

While the paleoenvironmental data suggests the Lower Athabasca was a suitable habitat for these earliest peoples, evidence of their occupation has yet to be found. This possibly reflects the rare chance discovery of materials of this age in undisturbed areas as well as, perhaps, the more closed forest habitat of the Athabasca as compared to the Peace River grasslands to the west or Lakelands to the south, which were geographically isolated from the Lower Athabasca both by distance and inhospitable tracts of newly formed Boreal forests. However, a fluted point found in a garden on Ethyl Lake, just west of Cold Lake (McCullough Consulting Ltd. 1981), is made out of Beaver River Sandstone. This suggests the stone material was originally obtained from a quarry on the Lower Athabasca as there is little possibility that Beaver River Sandstone would occur in local glacial deposits which were derived from glaciers in the Cold Lake region. The last glacier there entered from the northeast, well east of the outcrop area of Beaver River Sandstone (Ives and Fenton 1983).

The first evidence of actual occupation of the Lower Athabasca is by hunting people equipped with lanceolate-shaped spear points, a type known to most archaeologists as Agate Basin and named after a bison kill site in Wyoming where they were first found in the 1930s and later radiocarbon dated to around 10,000 years in age. Two points of this type have been found on the Lower Athabasca (Syncrude 1974); one in excavations at the Beaver Creek Quarry (B. Reeves, personal communication) and the other at the Gardiner Narrows site in the Birch Mountains. Although Agate Basin dates to 10,000 years ago in Wyoming, considerably more recent dates are associated with excavated sites in the Parklands and Mountains of Alberta (Reeves 1978). Here, the points (Agate Basin) date to 8,500-7,500 years ago and also occur in association with a lanceolate point style known as Lusk which takes its name from a site near Lusk, Wyoming. The two Athabasca specimens technologically are more similar to the Lusk than to the Agate Basin type. These points and more typical Agate Basin points have also been found eroding out on the south shore of Lake Athabasca (Wright 1975, Wilson 1981) as well as in excavations at a lake shore camp on Black Lake in northwestern Saskatchewan (Minni 1976). One site--known as the Lake One Dune Site--located in the grasslands of Wood Buffalo National Park southwest of Lac Claire may also contain Lusk points (Stevenson 1981a). These finds, although scattered, document the presence of early lakes and forest hunters in northeastern Alberta.

Points of this kind are also quite common in the Barren Lands of the Keewatin District of the Northwest Territories. Some archaeologists have used the name "Northern Plano" when referring to these finds and those from the nearby Barren Lands (Gordon 19/6, Noble 19/1), and have drawn their comparisons to the early Agate Basin site in Wyoming, inferring that these peoples in the forest and Barren Lands represented a movement north of Plains bison hunters into the forest. Their opinion is probably incorrect. These people were "Canoe Indians", already clearly adapted to the forests as points of the Lusk and Agate Basin style are particularly common on the shorelines of Glacial Lake Agassiz, a great glacial lake which occupied central and southern Manitoba during the last ice age and early postglacial times. A site of the culture, known as the Caribou Lake complex, found on the southern margin of Lake Agassiz, has been radiocarbon dated to 8,000 years ago (Buchner 1981, Stembring and Buchner 1980). A similar lanceolate point culture known as the Lakehead complex occurs around the edges of the Glacial Great Lakes. They and their Manitoba neighbours were caribou and moose hunters, fishers and fowlers who frequented the lakes and rivers within the Boreal forest in early postglacial times. A closely related hunting and fishing culture, termed the "Plains/Mountain Complex", occurs in the mountains and parklands of Alberta.

It is to the peoples of the forest and mountains that the early occupants of the Athabasca area are related. Their presence along the margins of the plains is the result of their displacement by a northward expansion of a specialized bison hunting culture known as the Cody Complex, named after a site near Cody, Wyoming where the distinctive, large stemmed spear points were first found. Beginning around 9,500 years ago, Cody's northern expansion coincides with a shift to a drier climate between 9,000 and 9,500 years ago. At this time the plains grassland expanded, displacing the Parklands and southern edge of the Boreal forest some 120 km or more north of their present positions.

Cody peoples were the first to develop sophisticated means of bison hunting, employing corrals and jumps to trap large numbers of these animals. This indicates they had developed the social organization, political control and religious beliefs needed to herd and trap bison on a large scale. Cody had an adaptive advantage over the earlier, less specialized Agate Basin hunters. As a result the Agate Basin peoples were displaced off the Plains. They continued to reside in the mountains, parklands and lakelands where they continued to practice a generalized hunting strategy in small nomadic groups--a pre-adaptation to requirements of the forest.

Around 8,300 years ago there was a brief period of rapid climatic change; winters were cold and stormy, and the grasslands and their carrying capacities shrank. The Cody complex disappears at this time from the Northern Plains. It would appear Cody was too specialized to adapt to this rapid change and disappeared from the archaeological record. This vacuum was filled once again by the older, lanceolate point, hunting culture who had been living in the mountains and parklands.

Cody complex points--known as Scotsbluff, named after a bison kill near Scotsbluff, Nebraska; and Alberta, named after our province--are very common in the Plains, Parklands and along the southern edge of the forest. Many have been found in the Peace River District. Contact, at least, did occur with the Lower Athabasca as demonstrated by a Cody complex point made of Beaver River Sandstone found in a plowed field near the town of Fort Assiniboine (Ives:personal communication). It is unlikely, however, that these specialized bison hunters could penetrate the forest lands without consequent loss of their identity.

## THE CULTURAL GAP (?) (5500 B.C.-CA.2000-1000 B.C.)

The next few thousand years of Lower Athabasca culture history are equally, if not more, obscure than the initial occupation, for, as we discuss below, little evidence has been found of Native occupation during this time, perhaps suggesting that it was, for awhile, of marginal value.

The next archaeological period in Alberta, known as the Middle Prehistoric, dates between around 5500 B.C. and A.D. 200-300. The cultures of this period are characterized by the use of stone dart points of various kinds, used with the spear thrower. This instrument consisted of a handheld, grooved, wooden throwing board with a hook on the back into which a spear was slotted. The atlatl, as it was known, operated as an extension of one's arm to increase leverage when discharging the spear. The projectile was capable of travelling a greater distance and had more force than a hand thrown spear. These weapons were still in use by the Aztecs when conquered by the Spanish and were very effective in penetrating the Spaniards' leather armour.

In the Alberta Plains, Parklands and Mountains, the archaeological record, particularly after 5,000 years ago, is relatively well known. It is characterized, like the Early Prehistoric, by both bison and generalized hunting cultures who either developed out of earlier groups or moved into the area from other regions. The opening of the Middle Prehistoric witnessed the movement of the Mummy Cave Complex--first discovered in a cave of this name in Wyoming--around 5700 B.C. onto the plains (Reeves 1978). Their appearance is accompanied by dart points with notches in their side--"side notched"--for hafting onto notched dart foreshafts. This represents a new hafting technique in contrast to the lanceolate points of the Early Prehistoric which were inserted into socketed foreshafts, glued and lashed. This notching and spear thrower technology first appeared in the woodlands of eastern North America some 2,000 years earlier. It gradually spread outwards over the continent and as in the case of Mummy Cave, probably represents an actual movement of peoples westward onto the plains and mountains from the eastern prairie edge.

Mummy Cave peoples were, like the much earlier Cody complex, sophisticated bison hunters--using bison corrals, surrounds and jumps. In the mountains, they also hunted other animals, trapped and fished. Projectile points of this culture, the types known as Bitterroot and Salmon River side notched--named after locales in Idaho where the points were first found--have an unusual distribution. None have yet been found in the Lower Athabasca-Lake Athabasca region. In the Parklands and Lakelands, they are common in collections made from plowed fields, but have not been found on the raised or present beach ridges around the lakes; for example, Lac La Biche (McCullough 1982). The absence of occupations of this age around the lakes is perhaps the result of fluctuating lake levels during this time. For example, Moore Lake located near Cold Lake, today a 90 ft deep lake, was 60 ft below its present level between 7200 and 3800 B.C. (Schweger et al 1981). Many shallow lakes in the parklands and lakelands simply dried up, particularly after 6500-6000 B.C. The climate during this time interval, sometimes referred to as the Altithermal or Atlantic, was dominated by dry westerly air, changed precipitation patterns, less cloud cover and slightly warmer summers and winters. Summer precipitation dropped markedly, and evaporation rates increased. The lakes lowered, and new shorelines, now drowned, were developed. Tha Mummy Cave complex campsites around the lakes would be located on these drowned shorelines. Changed lake and river levels would also have a major impact on the lake and river fisheries and migratory bird nesting grounds. Changes in these would in turn effect the Natives' landuse patterns. Fuel sources would also be radically altered, for the parkland groves were replaced by grassland communities, and the southern edge of the boreal forest was displaced on the order of 120 km to the northeast.

Bison populations generally increased in size and range during this period, and as a consequence, the Native peoples of the Mummy Cave complex thrived. Around 3000 B.C., the climate again changed. In the mountains snow packs grew, and in some areas small glaciers formed and advanced. Treelines shifted downwards. Along the south edge of the Boreal forest, some lakes began to fill, while others did not form until around 1000 B.C. The forest composition changed, and the parkland again advanced. Widespread muskeg development also began, both on the edge and in the forest itself. Over the next 1,000 or so years, these changes continued. By 2000-1500 B.C., the modern plant community boundaries were established.

The response of the Native peoples to these changed climatic and environmental conditions was complex as we would expect. In the Southern Alberta Rockies, they began to fire the forests to maintain their open valley grasslands (Reeves 1978). A similar response probably occurred in the Parklands and Peace River country. There, and in the forests, prehistoric Native people used fire to maintain the open meadows as late as the 1800s. Native people follow this practice today.

Culturally, changes were also going on. To the south in Wyoming, a new cultural complex known as McKean appears (Reeves 1985). Dating around 3000-2500 B.C., this new complex, named after a site in Wyoming, is characterized by a completely different social, political and religious organization and technology than that of the Mummy Cave peoples. They did not hunt bison by using corrals or jumps, as did the plains people, but ambushed them along trails and at water holes and fords. They cooked their food in earth ovens and believed in different methods of burying their dead. The McKean peoples originated in the Great Basin country where archaeologists can trace them back some thousands of years earlier. They used a distinctive lanceolate-shaped dart point, known as McKean, with a notch in its base. Associated with the lanceolate point, there is also a stemmed basally notched form known as Duncan, named after an early Plains Archaeologist. Around 1500 B.C. a type known as Hanna (named after an archaeologist's wife), characterized by broad notches placed in the bottom corners of the point ("corner notched") appears. It continues until around 1000 B.C. McKean spread out over the plains and mountains, appearing in southern Alberta around 2000 B.C. By 1500 B.C. they appear to have dominated the plains region. McKean points are also found in the parkland and in the southern edge of the Boreal forest--Calling Lake, for example (Gruhn 1981) which was parkland at that time. The points are very rare in the Lesser Slave and Peace River districts. They have not been found within the Boreal forest.

Mummy Cave complex peoples came into contact with McKean. Their point styles reflect the McKean influence with the basal notch from McKean transferred to the side notched dart points. This point style, known as Oxbow, reflects a diffusion of a new style throughout western Canada and characterizes the succeeding cultural phase of the Mummy Cave complex--named Oxbow after Oxbow, Saskatchewan where the first site was excavated in the 1950s.

Oxbow dates from around 2500-1000 B.C. It is an amalgamation of the older cultural tradition with elements derived from contact with McKean. Sites early in the phase (around 2500 B.C.-2000 B.C.) occur both in the Plains and Parklands, while later sites are located mostly in the Parklands which were also occupied by McKean. Oxbow points occur in surface collections in the Peace River, Lesser Slave Lake and Lakelands districts (McCullough 1982). They, as we discuss shortly, also occur in the northeastern Boreal forest.

McKean and Oxbow occur as discrete site occupations in the Plains and Parkland. These two archaeological cultures, based on what we know of their material culture and lifeways, represent distinct Native ethnic groups. Although we cannot put any historic tribal names on them because they are too far distant in the past and the connections to historic groups are too poorly defined at present, we can conceive of them to be separate--as separate a people as were the historic Blackfoot and Cree peoples who at contact spoke different languages, had separate gene pools, distinct social, political and religious organizations and customs, and different technologies for making, finishing and embellishing their tools and other artifacts.

A significant cultural change also occurs in the western Peace River district during this time. Excavated sites near Fort St. John in B.C. Hydro's proposed Dam Site C (Spurling 1980), as well as at Charlie Lake Cave (Fladmark et al 1984), have recovered distinctive artifact and stone material types very similar to those from sites of this age in northern and central British Columbia. There, they are associated with a distinctive forest culture, suggesting that around 3000 B.C. and correlating with changing climate and environment, the Peace River country and, based on surface artifact finds, the Northern Rockies as far south as the Athabasca Valley became part of a western Boreal forest culture area (Reeves 1978). The forests began to advance and close, and the game, formerly dominated by bison, was replaced by moose, caribou, elk and deer. With the appearance of a Boreal forest culture in the west (as yet unnamed by archaeologists), there existed three cultural traditions bordering the northeast Boreal forest--Oxbow, McKean and the Forest peoples. Later Middle Prehistoric cultures of the Plains and Parklands are related to minor stylistic changes and technologies of Oxbow and McKean. We shall revisit these later on.

Who, if anyone then, occupied the northeastern forests between 5500 B.C. and around 3500-1000 B.C.? Before we can examine and evaluate the evidence--which mostly consists of a few scattered finds of Oxbow points which some archaeologists (e.g., Pollock 1978, Donahue 1976b) attribute to Plains people--we must turn briefly to a review of the culture history of this period for the Lake Athabasca and Barren Lands region to set our area and the question of "who" in perspective.

Unlike the Boreal forest which lacks well-dated excavated sites, that of the Barren Lands, and to some extent Lake Athabasca, is relatively well documented.

On the Barren Grounds the lanceolate and Northern Plano caribou hunters all but disappear from the archaeological record by 5200 B.C. (Gordon, personal communication). A thousand years later this apparent vacuum is filled by a culture referred to as the Shield Archaic (Wright 1972 and 1981, Gordon 1976). Dated from 4200-1750 B.C., it consists of three periods.

Technologically, the Shield Archaic is characterized by a variety of large side notched dart/spear points. The Middle and Late periods (3500-1750 B.C.) are best represented in sites on Lake Athabasca (Gordon 1976, Wright 1975). Early Shield Archaic sites are absent around the lake, suggesting perhaps a drowned shoreline exists. Sites of this period are also rare to the north and east (ibid). During this time when the northern tree line was some 200 km beyond its present position, these people were, based on excavations, already well adapted caribou hunters and fishermen of both the Boreal forest and Barren Lands (ibid).

Shortly after 2000 B.C., the climate rapidly deteriorated; the forest edge retreated to the south of its present limits, and the

Shield Archaic people were replaced around 1500 B.C. by an arctic tundra adapted culture (Ibid). Known as the Arctic Small Tool tradition--because the peoples' technology emphasized small, very well-made tools--these people moved inwards from the Arctic coast where sites of their cultural tradition were present as early as 2500 B.C. Their territory extended as far south as the north shore of Lake Athabasca which they occupied between 1500 and 700 B.C. (Gordon 1977a). Some isolated artifacts of their culture have also been found on the south shore. Their way of life in the interior focused on caribou hunting, at which they were extremely proficient.

Around 700 B.C. a new tradition called Taltheilei appears (Gordon 1976, 1977b; Noble 1971, 1977, 1981). It represents the prehistoric Dene (Athabascan) people. Continuity is traced from this earliest time to the historic tribal groups--the Yellowknife and Chipewyan. Taltheilei tradition points are found in the Lower Athabasca, both in the valley as well as in the Birch Mountains, and mark the first well-documented Native occupation of the region (a subject we will discuss in more detail later on). What of earlier peoples in the Lower Athabasca? Was the region occupied by Plains people or Shield Archaic, Arctic Small Tool or by anyone at all? The evidence so far collected, as we discuss below, is not at all clear.

The evidence, as indicated by spear, dart and arrow point types from excavated or collected sites and radiocarbon dates, as described below, suggests a major "gap" in the historical record. In proposing this "gap", we would note that the only extensive excavations of Boreal forest campsites in the region have been at Gardiner Narrows and Eaglenest Lake in the Birch Mountains. We presume that what has been recovered there, as well as through the limited excavations and surface collections in the valley, reflects the region's culture history - an assumption that future studies hopefully will prove us wrong.

The Birch Mountain sites, although extensive and with good sized artifact samples, are mixtures of occupations of different ages due to their shallowness. The best chronological and cultural indicators are the dart and arrow points. We rely heavily on these in our discussion of the region's history. Point styles need not exclusively associate themselves with a single cultural group or environmental area, and one must be cautious in one's interpretation of the evidence which was found. When one finds a Plains style point, it does not necessarily mean that peoples from the Plains adapted to bison were occupying the area and hunting bison, for the area was always Boreal forest, and whoever was there had to adapt to the resources available--caribou, moose, fish, fowl and some bison. Nor does finding a Plains style point mean that Plains adapted people moved in and changed their lifestyle, as they would be moving from an easier life to one which, to them, was marginal and which required radically different landuse patterns, a change which they would not voluntarily undertake unless forced to do so as a result of other peoples intruding into their territory and physically displacing them from their homeland or as a result of a dramatic climatic change requiring significant adjustment to their lifestyle. These kinds of cultural adjustments did occur in Plains, Mountain and Barren Land prehistory. To demonstrate their occurrence anywhere, an archaeologist has to be able to show, through the analysis of a large collection of different kinds of artifacts, that the supposedly "intrusive" cultural group in the Forest is more like its purported Plains relative than the culture of earlier forest groups. In the case of the occasional Oxbow points, then, archaeologists who say they represent a Plains cultural intrusion have to demonstrate this with the presentation of similar assemblages to the Plains, not just the points. As the sites in the Lower Athabasca are mixed, or else the samples are very small, we are not yet in a position to do this, and it is more economical to view the points as a result of the spread of new, innovative or interesting forms between different Native groups rather than the movement of a people. "Oxbow" points are found in the Central Mackenzie and Yukon, where some archaeologists think they also represent a Plains intrusion (Noble 1971, Millar 1968, MacNeish 1964); while other archaeologists interpret it as a result of diffusion of the style (Clarke 1983, Workman 1978). Similar forms occur in the Great Basin in the Western United States, but curiously, none of the archaeologists concerned with this region has ever suggested a Plains intrusion into the Great Basin. We must then be cautious in reading too much into the record at this time in the Lower Athabasca.

With these cautionary notes in mind, let us now review the evidence. Side notched points of quite different and easily recognizable styles occur in both the Shield Archaic to the north and the Mummy Cave/Oxbow complex to the south. Either or both types should be present in the Lower Athabasca if peoples of these cultural traditions were present at that time.

The earliest Plains/Parklands style points from the Lower Athabasca are Oxbow side notched forms. The earlier Mummy Cave types--Bitterroot and Salmon River side notched--have not been found. Single finds of Oxbow style points have been made in test excavations at Gardiner Lake, HcPj-14 (Donahue 1976b) in the Birch Mountains, a site on Gregoire Lake (Pollock 1978), and in test excavations from one site on the east side of the Athabasca River--HhOv-7 (Head 1979b). None are made of Beaver River Sandstone. Southwest of the Birch Mountains, Oxbow points have been found in excavations at a site on North Wabasca Lake (Sims 1981). The absence of any earlier Plains/Parkland style points and the presence of Oxbow style suggests a date between 3000 and 1000 B.C. (the dates of the style in the Plains/Parklands) for the appearance of the style in the Lower Athabasca.

The Shield Archaic tradition is represented by a single find of a Middle Shield Archaic (3500-1750 B.C.) point style from a site (HhOv-18) on the Alsands Lease (Ronaghan 1980).

The point styles, then, based on their dates in adjacent areas, point to a major gap in the record (between 1000-3000 and 5500 B.C.) of human occupation in the Lower Athabasca. This gap is supported by the radiocarbon dates from sites excavated to date. The earliest dated occupation in the Birch Mountains comes from the HcPj-4 site on Big Island Lake, where a date of around 1660 B.C. (RL-553) was obtained on charcoal. Some stemmed point styles from the Birch Mountains are very similar to forms from the Peace River (Reeves:personal communication), associated there with the western Boreal Forest Cultural complex and dated at around 1000 B.C., suggesting the same cultural complex may occur in the Lower Athabasca at this time. A number of similar looking forms were found in surface collections from the Lake One Dune Site, west of Lac Claire in Wood Buffalo National Park (Stevenson 1981a), and similar forms have been found in the Caribou Mountains at the Wentzel Lake Site (Conaty 1977) as well as Calling Lake (Gruhn 1981) and appear to date around this time.

In the valley, a date of 2000 B.C. was obtained on charcoal from a site, HhOv-73, on the Alsands Lease (Le Blanc 1984). Discovered in 1981 during the Alsands Historical Resources Impact Assessment, small tools, "microblades", of a distinctive Arctic-like tradition were found, representing an "unique" occupation in Alberta's northern forests. Its significance to the region's prehistory is difficult to assess as no projectile points were found to facilitate comparison. The site, located within the Tar Sands development area, was initially recommended for total excavation. Archaeologists from the Archaeological Survey of Alberta excavated the site between 1982 and 1983.

If a gap exists in the prehistoric record, as our information suggests, what does it mean? Was there a period in time when so few people occupied the area that they left no record yet found by archaeologists and/or is our view being distorted by the settlement pattern during this time, which one may recall, was during the Altithermal climatic interval--a time when drastic changes occurred in the adjacent Lakelands in the south? There, lake levels dropped significantly, and a gap in the occupation record, adjacent to the lakes, is interpreted as reflecting the occupation by Mummy Cave peoples of now drowned shorelines. We know these people were there because their points are common in surface collections from plowed fields in the Parkland area.

What happened to the lake levels in the Lower Athabasca? Did they also drop? We do not know as sediment cores have not been taken or analyzed from lakes such as Gregoire Lake in the lowlands or Gardiner Lake in the Birch Mountains. Eaglenest Lake in the Birch Mountains, where the one core has been taken, shows no change in lake level (Ives: personal communication). Perhaps this is the case in the highlands. What about the lowlands?

A clue comes from the archaeological record on the shores of Lake Athabasca (Wright 1975) and Black Lake (Minni 1976) where a gap in projectile point styles between the Middle Shield Archaic and Northern Plano (ca. 5500-3000 B.C.) has been recognized. Side notched points of the Early Shield Archaic or Plains styles have not been found. A break also occurs in the record to the north, in the Barren Lands. There are no radiocarbon dated sites between 5600-4200 B.C. (Gordon 1977:personal communication). In the Great Bear-Great Slave area to the west, there appears to be a gap between 4500-3500 B.C. (Noble 1971, 1977 and 1981). Archaeological studies in these areas have been quite intensive, and included extensive surface collections and excavations. Early as well as later Boreal forest and Barren Lands cultures occur. The occupational gap is at the height of the dry drought episode of the Altithermal, when lake levels dropped sixty feet in Alberta's Parklands.

Does this gap in the northern record also reflect a similar drop in lake levels around Athabasca and occupation of a now drowned shoreline? While this is the most economical explanation for this lake, both Great Slave and Great Bear are characterized by a series of abandoned beaches dating after the ice receded and formed as the land rebounded in response to removal of the ice, the weight of which had depressed it. They should encompass the height of the Altithermal climatic interval, but no occupation of this age has yet been found and dated. Perhaps the culture has not been recognized.

Many sites on the Lower Athabasca are on ancient land forms, formed during late glacial times, as are those at Eaglenest Lake, and would have been available for people to occupy had the people been present. Yet, evidence has not been found. A lot of the activity on the Lower Athabasca is associated with the use of the Beaver River Sandstone quarries, which as we will discuss later, appears to have been primarily associated with the Taltheilei peoples' occupation of the region after 700 B.C. Perhaps our missing peoples made little use of the quarries, preferring other stone materials for use as points; for example, as did those who made the Oxbow style points. Perhaps, the quarries were difficult to get at. Maybe camps of this age were on the low flood plains which formed during this time, and they are now destroyed or deeply buried. Perhaps the answer or part of it lies in what the Lower Athabasca environment was like between 9,000 and 3,000 years ago. Was the Taltheilei tradition the first and only intensive occupation of the region? What was different in earlier times? The fish populations--in terms of numbers, composition, migration and spawning patterns--may have been affected by the reduced lake levels, stream flows, and possibly increased siltation during the Altithermal climate episode. Lake and river fish stocks could have been drastically reduced or eliminated as inlets and outlets shallowed or dried up and became inaccessible to migration and spawning runs. Therefore, the rivers and lakes could be very unproductive and/or easily overfished. Fish stocks would not begin to re-establish themselves until sometime after 5,800 years ago.

Caribou populations, _if_ present in the Birch Mountains in earlier times, might have migrated further north in response to changed ground cover. Perhaps, the caribou did not even migrate into the Birch Mountains until the climate changed, which resulted in the establishment of the modern Boreal forest around 1750 B.C. This would be the most economic explanation for the general lack of occupation predating this time in the Birch Mountains.

One could easily visualize a case where the Lower Athabasca, lacking significant fisheries and caribou, would not be particularly attractive to Native peoples, and as a result the region was economically unproductive and very peripheral to Native settlement and subsistence at that time, which focused on the large lakes and the Barren Grounds forest edge, where there is ample evidence of occupation by Middle and Late Shield Archaic peoples beginning around 3800 B.C. The Lower Athabasca at that time would be primarily what it was in the fur trade, a canoe route through which people passed on their way to more productive lands to the north. There would be little, if any, evidence of their passing.

While much archaeological and environmental work needs to be done to test and hopefully disprove these speculations of ours, they do suggest there is a great deal yet to learn--almost everything in fact--of this period in Lower Athabasca prehistory from which we now turn to a review of the past 3,000 years and the Dene ancestors of the region--the Taitheilei tradition.

## THE ATHABASCANS: THE LAST 2,500 YEARS

The prehistory of the last 2,500 years in the Lower Athabasca is that of the Athabascan peoples--the ancestors of the Sekani, Beaver, Slavey and Chipewyan. Prehistorically, these people are represented by an archaeological cultural tradition known as Taltheilei. In the Barren Grounds and Great Slave-Great Bear area, the Taltheilei tradition has been traced from the historic Dene people--Yellowknife, Dogribs and Chipewyans back some 2,600 years (Noble 1971, 1977, 1981; Gordon 1977a, 1977b).

Taltheilei is unrelated technologically to the earlier Arctic Small Tool tradition, and in the view of archaeologists working in the Mackenzie and Barren Lands (ibid), it represents an intrusive ethnic group who moved in from the Boreal forest to the south and west, displacing the Arctic Small Tool peoples out of both the Great Bear, Slave and Lake Athabasca region, and the Barren Lands. The tradition, on the basis of survey and excavations in these areas, has been divided into a number of periods/complexes based on distinctive dart, spear and arrow point styles.

The Early and Middle Taltheilei periods (650 B.C.-A.D. 800) in these areas are represented by a variety of generally large lanceolate, stemmed and occasional side notched shaped spear points. Some of the styles are very similar in form and finishing to Early Prehistoric period forms associated with the Agate Basin, Cody and lanceolate point complexes. They are hard to tell apart and as a result, some archaeologists working in the Lower Athabasca, where Taltheilei points are quite common, have misidentified the points they found; for example, a stemmed point from a site on the Muskeg River was first identified as an Early Prehistoric type known as Hell Gap (Sims 1975), a stemmed form type sometimes found associated in Wyoming with the Agate Basin complex. The point, however, is a typical Early-Middle

Taithellel style (Ives:personal communication; Reeves:personal communication). Late Taithellel, in addition to lanceolate points which continue from the Middle, also contains small corner and side notched arrow heads. Bone points also occur.

The Taithellel tradition is well represented in the Lower Athabasca and Peace around Lake Athabasca, as well as other areas of the northern Boreal forest and Peace River and Lakelands. Finds of the distinctive lanceolate and side notched points have been found in plowed fields from Cold Lake on the east (McCullough et al 1981) to the Peace River country (Spurling 1980) on the west. Their distribution is more or less coincident with that of the Dene people at the beginning of the fur trade. However, there is as yet no evidence from excavated sites in this area to suggest the Taithellel tradition originated in this region. The typical Taithellel style lanceolate and stemmed points have been found in only two excavated sites--The Charlie Lake Cave near Fort St. John (Fladmark et al 1984) and the Karpinski site (Bryan and Conaty 1975), a surface campsite south of Peace River. Both of these are radiocarbon dated around 500-800 A.D. and are late rather than early in the Taithellel tradition. Earlier occupations in Charlie Lake and a nearby site known as Farrell Creek on the Peace River are characterized by the small side notched and stemmed dart points, characteristic at this time (as mentioned earlier in our discussion) of the western forests of Alberta and adjacent British Columbia, suggesting that the Taithellel tradition did not originate in this area, but rather may represent either a later cultural intrusion or innovation of quite different spear point styles and hafting techniques by peoples of the Peace River area. Later occupations in this and the Lakelands to the east are characterized by small spear and arrow heads and bone points, like those of the Taithellel further north.

If Taithellel did not, as the precedent evidence suggests, originate in the Peace River, where did it develop? Probably some distance north in the foothills and flanks of the Mackenzie and in the Yukon further west. Excavations at a series of sites at Fisherman Lake in the foothills north of Fort Liard have recovered a long and rich, but mixed, archaeological record from lake beaches and other areas around the lake (Millar 1968). The Middle Taltheilei Tradition there is represented by the Mackenzie complex, dating around 250 B.C.-A.D. 500 and is preceded by another complex known as Julian, dating around 1900-750 B.C. It contains notched dart points as well as lanceolate and stemmed (?) spear points as does an earlier complex--the Pointed Mountain, dating around 4000-2100 B.C. The presence of the Taltheilei style points at an earlier date in these sites than their occurrence in the forests and Barren Lands to the east, or the Peace to the south, suggests the tradition most probably spread out from this region sometime after 700 B.C., first eastward through the forests of the Liard and Peace and Lower Athabasca to the Barren Lands and later southwards into the Peace. The small notched dart points which occur in the Julian and Pointed Mountain complexes at Fisherman Lake are very similar to those from the Peace River sites to the south; and they, as well as other tools in the sites, indicate to us that they are regional expressions of an earlier, much broader Athabascan Northern Forest cultural tradition.

The course of history in the Boreal Forest is, from Taltheilei times on, separate and largely isolated from the Plains/Parklands to the south. There, other changes are occurring—new cultural groups appearing--which some archaeologists have suggested also appeared in the Lower Athabasca as well as further north on Lake Athabasca itself. In both areas, a small side notched dart point found in camps on the north shore of Lake Athabasca (Wright 1975), as well as the Beaver River Workshop (Syncrude 1974) and other sites in the valley, and at Gregoire Lake (Pollock 1978) has been described by some archaeologists (ibid) as a Plains dart point known as Besant side notch. These archaeologists have interpreted these finds as representing an intrusion of Plains bison hunters as far north as the Slave River. To other, more practised eyes (Ives 1977a, 1977b; Reeves 1983), the two styles are quite different, and the forest style is a typical Taltheilei Tradition point dating around A.D. 500-800. To set the Lower Athabasca in perspective at this time, we again turn to a brief review of the latter part of the Plains/Parklands prehistory which, like earlier times, is characterized by the presence of two separate cultural traditions.

The cultural tradition which began with the McKean phase continues through the Hanna phase, characterized by broad corner notched points, to the Pelican Lake phase, which has a narrower corner notched point known as Pelican Lake (named after Pelican Lake, Saskatchewan where the points were first found). The Pelican Lake phase begins around 1000 B.C. when the Pelican Lake styles became more common than Hanna, ending around A.D. 100 when the bow and arrow appears, replacing the dart and spear thrower. These new technologies mark the advent of the last period in Alberta prehistory, the Late Prehistoric, which dates to the 1800s when European flintlocks began to replace the bow and arrow.

Pelican Lake peoples--unlike their predecessors, McKean--were very sophisticated bison hunters, using corrals and jumps, the techniques, social, political and religious controls for which had developed over 1000 or so years since the McKean people first arrived in the bison-rich country of the Northwestern Plains of Alberta and Montana. Pelican Lake's trade networks were exceptionally well developed. They obtained most of their stone from quarries in the Northern Rockies, many far south in Montana. The northern boundary of their territory coincides more or less with the forest edge (Reeves 1983).

The second cultural tradition which began with Mummy Cave and Oxbow continues through a cultural phase known as Sandy Creek, after a site in Saskatchewan. A new side notched dart point of the same name, lacking the deep basal notch of Oxbow, is characteristic of the phase which dates between 1000 B.C. and 100 B.C. Its territory is centered on the Parkland/Forest edge.

Sandy Creek is followed by the Besant phase (A.D. 100-700), the last of the dart using phases of this cultural tradition. Named after the Besant Valley in Saskatchewan, the characteristic point is a side notched dart point, "Besant Side Notched". In later sites, after A.D. 400, small side notched arrow points of the same style as the dart points occur with them. By A.D. 700 the dart points are gone.

The Besant people were, like their Pelican Lake counterparts, very sophisticated bison hunters, but unlike them, they developed a complex trade network with a farming people known as Hopewell who lived in the Eastern Woodlands of the United States. The Hopewells were the first society in eastern North America to have a sound corn horticultural base, which resulted in the florescence, for a short time (ca. A.D. 1-A.D. 400.), of a social-economically class-stratified society. Social and political controls were well developed, as were their religious beliefs, and the people for a brief period of time were not only able to control a large part of the Eastern Woodland, but also developed a complex trade network to the Gulf Coast, the American Southwest and to the Plains and Rocky Mountains. Through the Besant people, they were able to obtain such items as obsidian from quarries in Yellowstone National Park and flint from North Dakota, which was fashioned into large ceremonial knives and buried in some numbers in log tombs with their dead leaders, over which an earth mound was built. Plains grizzly bear skulls and other paraphernalia--conch shells from the Gulf, for example--were also buried with the dead.

Besant sites on the Missouri also have burial mounds and pottery vessels of typical Hopewellian design. Their stone material trade network is characterized by the extensive use of flint from the Dakota Knive River flint quarries, and the archaeological evidence--sites and their radiocarbon dates--indicate that for a brief period of time (around A.D. 100), they pushed the Pelican Lake peoples off the Plains into the mountains. The northern boundary of Besant, like Pelican Lake, is along the Parklands/Forest edge.

The last phases of the Plains and Parklands are characterized by arrow points and ceramics and represent both the two older cultural traditions as well as new ones appearing in the area at the close of the prehistoric.

Pelican Lake, around A.D. 100, develops into a phase known as Avonlea (after Avonlea, Saskatchewan) where the distinctive side notched arrow points--known as Timber Ridge, after a site in Northern Montana--were first found. The points are beautifully made and finely finished, and represent a revival of the "high" technology of some of the Early Prehistoric cultural complexes. Avonlea were the consummate bison hunters of the Northern Plains and appear over their 700 year span to have developed the bison culture to its ultimate form in the bison-rich Western Plains. Their territory was more circumscribed than other groups', and their northern boundary coincides more or less with the course of the North Saskatchewan River.

In the mountains, Avonlea develops (ca., A.D. 1200) into a phase known as Tobacco Plains, named after the principal wintering grounds of the Kootenay Indians in the Kootenay Valley west of the Rockies. This phase represents the prehistoric Kootenais, who in the eighteenth century ranged the mountains from the North Saskatchewan Valley south.

On the Plains, Besant develops into the Old Woman's phase, ca. A.D. 700, and characterized by small side notched arrow points known as "Plains Side Notched" and different ceramic styles from Besant. Part of the Avonlea people--in the western plains--became absorbed in this new phase, named after the Old Woman's Buffalo Jump near Nanton, a traditional Peigan jump. Old Woman's represents the prehistoric Blackfoot people--the Peigan, Blood and Blackfoot. Their northern territorial boundary is further north than Avonlea's. A few late sites of the phase have been found in the Lakelands along the forest edge. Some archaeologists have claimed that both Avonlea and Old Woman's people penetrated the Boreal forest as far north as the Peace and Slave rivers (e.g., Stevenson 1981b, Pollock 1977c). Again, these claims, like earlier ones, are based on point style similarities which unless the rest of the stone tool assemblage is the same, represent, as do the earlier "contacts"--Oxbow culture contact--and diffusion of new point styles rather than the intrusion of a new group.

Two intrusive cultural traditions also appear at the close of the prehistoric. In the Plains, a site known as the Cluny Earth Lodge Village--a fortified village site, was found some years ago on the Bow River. The only site of its kind in Alberta, excavations have shown it was built in the late 1700s by a group of village-farming Indians from the Missouri River--probably the Hidatsa--who had fled their homeland to escape the Sioux who were raiding the villages at that time, or the dreaded small pox, the first epidemics of which were then sweeping the eastern woodland. Their occupation was evidently shortlived, a year or two. They tried to plant corn and maintain a traditional lifestyle in a country unsuited to the growth of Indian corn, and they passed without further trace into the archaeological record.

The Cree also appear in the Parklands/Lakelands and Boreal forest during the 1700s as they moved west, advancing in front of the European fur traders. Some potsherds of their distinctive pottery type have been found at sites in northeastern Alberta (Pollock 1977c), and a large vessel at Black Lake in northwestern Saskatchewan (Minnie 1976). Except for Black Lake, the most northerly occurrence of the pottery style, these other Cree sites have yet to be excavated.

We now turn to a review of the Lower Athabasca's later prehistory--that of the Taltheilei tradition which is by far the most intensive and the time within which the Beaver Creek sandstone quarries are heavily exploited. In the Birch Mountains, excavations at Gardiner (Sims 1976a) and Eaglenest Lake (Ives 1977a, 1981a) have revealed intensive Taltheilei occupations which, based on the lanceolate and stemmed point styles, along with radiocarbon dates from Eaglenest and Pelican Lake, dates from around 500 B.C. to A.D. 1500. A common point style in the Birch Mountains are small, convex-based dart points with broad side notches. These characteristic point types occur in a site on the northwest shore of Lake Athabasca where they date to around A.D. 500-600 and have been, unfortunately as we discussed earlier, misidentified as a Plains type--Besant side notched (Wright 1975). At Eaglenest, a later style--probably an early side notched arrow point, dates around A.D. 920. In the Lower Athabasca, examples of these Taltheilei corner and side notched forms have been found in the Beaver Creek Quarry (Syncrude 1973) and another nearby quarry site (HhOv-31) (Sims 1975), and campsite (HhOv-4), a workshop (HhOv-18) on the Alsands Lease (Ronaghan 1980) and a site on Gregoire Lake (Pollock 1978). Most of the points on the Athabasca, as well as some from the Birch Mountains, are manufactured from Beaver River Sandstone, as is a specimen of this type from the Alook site on North Wabasca Lake (Sims 1981). Later poorly made side notched arrow points are represented by a specimen from Gregoire Lake (Pollock 1978), compared by him to the Plains Avonlea but much closer in form and technology to Late Taltheilei specimens from Calling Lake, dated at around A.D. 1500 (Gruhn 1981), or the western Peace River district at Charlie Lake Cave (Fladmark et al 1984).

The Taltheilei point styles in the Lower Athabasca, characterized by stemmed, lanceolate and most commonly small side notched dart points which occur in sites dating around A.D. 500-1000, without the larger lanceolate and stemmed spear points of the Taltheilei tradition further north in association, suggest to us the definition of a regional variant on the Taltheilei tradition. It existed in the Lower Athabasca in which small darts perhaps were more useful in hunting game in the Boreal forest than the large spear points in communal hunting of caribou in the open forest fringe or Barren Grounds. This particular point style is not confined to the Lower Athabasca but occurs as well in the Lakeland region to the south and west (McCullough 1982, Le Blanc 1981) as well as on Lake Athabasca (Wright 1975) and the Peace-Athabasca Delta (Stevenson 1981a) to the north.

The stone tool technology of the Taltheilei tradition in the northern forests has two basic expressions. One is the extensive use of the Beaver River Sandstone Quarry sources to manufacture blanks and tools, characteristic of the tradition, while the second aspect is the reduction of chert pebbles through a splitting technique to produce blanks for tools. This technique employed a stone hammerstone and a stone anvil on which the pebble was placed on one end. When struck, the pebble split into pieces, shaped like orange segments with damage on each end or pole, known as the bipolar split pebble technique. The technology was widely spread in the Peace River-Boreal forest where these materials were common, as well as on the Plains and Parklands to the south where it also reflects the lack of availability of large sized, fine-grained material (chert) to manufacture tools. The split pebbles were modified into a wide variety of tools, including points, small knives, scrapers and wedges. Their sharp edges could also be used without any further working.

While not all cultures employed the split pebble technique, either in the Forest or Plains, it is widespread, and on the Plains, it appears to reflect the seasonal availability of, or access to, the quarries of the Northern Rockies, for the plains of Alberta, like the forests, are blanketed by glacial deposits. Only a few small bedrock outcrops of good quality material occur. In contrast, in the Mountains large sized, good quality material is available from quarries. Pebble cherts are rarely used in this area even though they occur in the gravels and tills.

Other tools also characterize this regional Taltheilei tradition centred in the forests of Northern Alberta. Like the points, the knives and scrapers are distinctive in form and size. The knives are small, generally less than 8 cm in length and triangular-shaped. They were probably slotted into a bone handle for use in skinning and butchering the game. Earlier knives in the forest, as well as those in the Barren Lands--Taltheilei--are generally quite large, up to 30 cm in length and were handheld.

Scrapers are also small. Generally, they were simply a roughly triangular-shaped flake with an edge worked on the wide end. Very little other finishing was done. Again in contrast, earlier scrapers and those in the Barren Ground were generally larger, and more care was taken with their manufacture and finish.

As well as the small tools, the Taltheilei people in the forest also used a series of large heavy duty tools--used for wood working (chopping and planing) as well as large game butchering and bone breaking to extract marrow. These tools were manufactured using the quartzite cobbles as raw material, which were broken often by a "bipolar" technique like the chert pebbles and used/or modified into various tools. (Quartzite is a strong and coarse material and holds an edge much better than the fine-grained cherts.) Among the tools used were large, oval shaped flakes, often spalled off the surface of the cobble. These may be retouched to obtain the proper shape. Among the Athabascans these tools are called "chi thos" and used by women primarily to flesh out hides. They are a distinctive tool of the northern forests, as are the notched axes and adzes, used both in woodworking as well as butchering. Simple cobble spalls were used for a variety of skinning, cutting and chopping tasks. These, along with the small stone tools, help to define the people archaeologically, separating them from both neighboring as well as earlier groups.

The Taltheilei tradition throughout its territory also has a distinctive bone tool industry, which because of the acidic forest soils in which most sites are found, has not preserved very well as the bones have been leached away. They made a variety of bone tools, among the most distinctive of which were bone points with one or more barbs on one side. These were used both in hunting large and small game as well as fur bearers. A beautifully made, complete point, some 30 cm long, was found by a trapper in the Gardiner Lakes area (Sims 1977). Broken specimens, tips mainly, have been recovered from a number of sites. Split and bevelled antler wedges were also fashioned and used in wood and hide working, as were a number of other tools.

Although the stone materials that the people used in the region were primarily of local origin, the distribution of Beaver River Sandstone gives us some idea of the general territory these Taltheilei people moved through and exchanges they made with other groups.

Artifacts of Beaver River Sandstone are most common in the Athabasca Valley, and their numbers decrease as we move away from the quarries. To the south, they occur in sites in the Gregoire

Lake area, along the Clearwater River and across the Methy Portage, in sites on Peter Pond Lake, Lac La Londe and Lac La Roche in Saskatchewan (Fenton and Ives 1982). To the south, some flakes have been found in sites on the lakes in the Christina River drainage, and the material is also reported in the Primrose Lake area in Saskatchewan (ibid) and Cold Lake in the Alberta Lakelands, also at Lac La Biche and from excavations at Calling Lake (Gruhn 1981) and North Wabasca Lake (McCullough 1982). Northwards, Beaver River Sandstone is not uncommon in the Birch Mountains (Ives 1981a). Flakes of it have been found on the Lower Peace, the Peace Point site (Stevenson n.d.), as well as on the Slave (Historic Studies Associates 1985) and in a site in the Caribou mountains at Wentzel Lake (Conaty 1977). It may be present in sites on Lake Athabasca (Reeves:personal communication).

Some evidence of long distance trade has also been found. In the Birch Mountains an obsidian (volcanic glass) flake was found. The obsidian probably came from the Telegraph Creek region in northwestern B.C. where a number of obsidian quarries have been found on the ridges of Mt. Edziza-Ice Mountain, a volcano last active around 6,000 years ago and 1200 km away from the Lower Athabasca. These quarries were the source of obsidian found in sites in the Peace River country to the west--Charlie Lake Cave (Fladmark et al 1984) and sites on the Peace at Dam Site C (Spurling 1980). There, they may occur in association with the Northwestern Boreal Forest Cultural Complex, dating around 3000-1000 B.C. Obsidian flakes, identified as from Mt. Edziza, have also been found in the Caribou Mountains (Donahue 1976b) and at a site on Lesser Slave Lake, where it would date to around A.D. 500-800 (Le Blanc:personal communication). At Eaglenest Lake, a small flake of a volcanic material known as welded tuff, was also found (Ives and Hardy 1983). The source for this was the Tertiary Hills located on the Keel River, 1800 km down the Mackenzie River. The rare occurrence of these exotic materials indicates the far-ranging, but infrequent, contacts of the Taltheilei tradition with distant groups. In contrast, in the Plains, Parklands and Mountains further south, long distance trade is generally quite common and large amounts of material are moved about; for example, flint from the quarries on the Knife River in North Dakota, was found in a Besant bison kill near Stettler, Alberta. It constitutes essentially 99% of the artifacts recovered.

The Lower Athabasca Taltheilei tradition people also shared in other distinctive aspects of the Forest Athabascans subsistence and settlement as well as those which reflected the food resources of the lands they occupied. In their sites, archaeologists find their hearths generally are simply built on the surface. Some may have a rock ring around, and they characteristically contain very large amounts of tiny burned and calcined bone fragments of both large and small game animals. The pattern is quite unusual in comparison to the Plains where there is very little calcined bone in the fires. Perhaps the forest people tossed the bone in the fires for fuel after the meat was stripped. Another feature of their cookery is the general lack of fire broken rocks from heating or cooking fires in their sites. In the Plains, Parklands and Mountains, rock is extensively used both in preparing barbecue pits for hot rock roasting, as well as stone boiling. (In this technique, rocks were heated up in a fire, taken out and placed in a vessel containing water or soup to heat the mixture and bring it to a boil.) Many sites to the south are literally paved with the discarded rock from these activities. Basin and bowl-shaped pits, hearths and baking/steaming ovens also a feature of these other cultures' cookery are not found in Taltheilei. Rock filled hearths are extremely rare in Taltheilei.

Little is known as yet of the kind and size of tents and the arrangements of their camps. Tent rings--rings of stones with internal hearths--which were used to anchor the base of the conical tent have been found on the north shore of Lake Athabasca. One excavated on the Charlotte River, associated with Late Taltheilei, yielded a radiocarbon date of A.D. 1340 (Wright 1975).

The seasonal round of activities of the Late Taltheilei peoples is only rudimentally known as the bones of the food animals the people hunted have been destroyed by the forest soil acids in the sites so far excavated in the Lower Athabasca and Birch Mountains. Only a few calcined remains have been found in the prehistoric occupations. An historic aged occupation at Eaglenest Lake contained calcined and burned caribou (?) and moose-sized bones, small to mid-sized birds, fish and hare-sized bones in and around a hearth, which, when radiocarbon dated, yielded a modern date (Ives 1982).

Two sites tested on the Clearwater River (Pollock 1978) at portage locations--Gros Roche (HeOn-1) and Limestone (HdOr-1)--yielded the remains of mallard, beaver, moose, dog or wolf. HeOn-1 also had muskrat, red squirrel and pike; and HdOr-1, a possible caribou bone. Pike, moose and muskrat were also found at a site on the Cascade Rapids (HeOn-3), and pike at a site (HeOn-1) on Gipsy Lake in the Christina River system. Another site in this system at Pine Portage (HeOn-1) had martin and bear bones in it. These scattered remains give us a picture of the broad subsistence base of these forest people.

Peace Point (Stevenson n.d.) provides us with an exceptional view of their settlement and subsistence over the last 2,500 years. The site, situated on an alluvial river terrace formed by flood deposits of the Peace, had within its 1.6 m of sediments eighteen occupations separated by fine silts. Each may represent a single seasonal encampment.

The area is an open grassland enclave, and as a result, bone preservation is exceptional. The lowest level, dating to 500 B.C., was a late summer-fall hunting camp. Elk, moose and bison were present, while small mammals, birds and fish were absent. In contrast, later levels often contained these remains. Level 5, for example, dating a few hundred years later, lacked any identifiable big game but had small mammals, trumpeter swan, other birds and fresh-water clams. It was a spring-early summer camp. This alternating pattern of seasonal use characterizes the occupations at the site. Later occupations, such as Levels 11 and 12, dated at A.D. 600, contained large mammals--bison and caribou--and small mammals--beaver and otter--as well as birds--grouse, ptarmigan and unidentifiable bird remains. A unique find was part of a grizzly bear skull--the maxilla (upper jaw and palate). Historically, there is no mention of grizzly bears in the area. This occupation was an early summer camp. Fish were identified in the latest occupations which date from the fur trade, around A.D. 1800 and later. These occupations record a change in activities, with many more fur bearers present, a variety of fish, as well as the larger game animals, upland birds and migratory waterfowl. The sites also appear to have been occupied for a longer period of time during the warm months while people were trapping in the area.

The Peace Point site, as outlined above, provides us with a glimpse of the local Taitheliei peoples' subsistence and the seasonal variations which occurred in one area. Although a very major and important site to our understanding of past lifeways, it was only a part of the seasonal round. It and other sites need to be extensively excavated before we will be able to understand the extent of the seasonal and annual round, the changes in subsistence and settlement size (for example, the number of tents involved) or other aspects of the peoples' social and political organization. While we may eventually come to understand something of these parts of the peoples' life and how they evolved or changed through time, if they did, other aspects of their culture--their religious beliefs and views of the world--will probably remain forever hidden from us. Only the few paintings and symbols of the rock art sites of the Shield and forest are left to evoke this part of the past.

## THE BEAVER RIVER QUARRIES IN PERSPECTIVE

The archaeology of the Boreal forest and the Lower Athabasca, as outlined in the preceding pages, does not parallel that of the Plains, Parklands and Mountains to the south, nor that of the large lakes and Barren Lands to the north. Archaeological studies, the first were those of Syncrude in 1972, are only a scant fourteen years old. The land is vast, largely unknown, and it is difficult to find the sites which have survived. By their very nature, most sites are small and difficult to work with, reflecting the nature of Native life in these forested lands. Only the barest outlines are known, and much remains to be learned.

Concentrations of Native settlement do occur in certain places and at certain times. The rich food resources of the Lakelands along the south and the Peace-Athabasca Delta have, since man first entered the area some 8,000 to 10,000 years ago, been a focus for human settlement. Along the river systems, settlement is generally dispersed--except where critical resources are known to occur such as in the area of Beaver River Sandstone outcrops. The pattern of site distribution and density in the vicinity of the quarries is unique within the non-food rich areas of the northern forests, not only of Alberta, but also the neighboring provinces. The Lower Athabasca was not particularly rich in food resources and archaeologically, may have been a marginal area prior to 3,000 or so years ago. We have suggested that the environment in the earlier times was probably even more limiting than today. Because of changed precipitation and stream flow patterns, fish stocks dwindled. Perhaps by 3,000 or so years ago, the lands may have regained much of its productivity, and for awhile, at least, may have been even more productive than during the historic period, a possible explanation of the intensive occupation associated with the quarries. Alternatively, the pattern we see in the Beaver River Sandstone explanation reflects a preference by the Taltheilei Tradition people for this particular stone material, as opposed to earlier peoples who only occasionally used this source, preferring other materials for use in manufacturing their small tools. Hence, the general lack of sites of an earlier age.

Native peoples' preferences for stone materials change markedly through time, and they often went to great lengths to obtain favorite kinds of stone from very inaccessible sources which were difficult to exploit. Between 7,500 and 3,000 years ago for example, peoples in the Southern Rockies eagerly sought a rare, extremely hard bedrock chert. While it is extremely difficult to find and to mine, they actually sank adits up to twelve feet deep in the veins to get the material when other material was available nearby, our most economic explanation is that these people liked this material.

The Beaver River Sandstone Quarry and Workshops may have been exploited for the same reason; the Taltheilei people liked this material and mined it intensively. How would this affect their seasonal/settlement patterns? Did different groups have access to or use of the quarries or did one group "own" the source and trade raw materials or finished products with others? Both are patterns we find at various times and places in the Plains and Rockies.

Whatever the reasons, and the above are only a few of the possible explanations, the Beaver River Sandstone Quarry/Workshops are not only of regional significance in understanding the unique Native cultural and landuse histories of the Lower Athabasca, but from what we know, the sites themselves are unique as nowhere else in the Boreal forest of Alberta--or for that matter the Plains, Parklands or Mountains--an easily accessible bedrock quarry source where large quantities of material could be relatively easily obtained. The only other area in Alberta which contains bedrock quarries are the mountains, and only one set has so far been recorded (located in the Crowsnest Pass). They are geologically complex and have a quite different mining pattern associated with them (Reeves:personal communication).

Much yet remains to be learned of the provincially unique Beaver River Sandstone Quarry/Workshop use patterns in terms of mining technology and workshop activities. We still do not know, for example, how the material was mined (were pits opened, area stripped, blocks pried loose, or the material dug out of side slopes or tree falls, or are we totally misinterpreting the record?). Syncrude's initial (1974) studies at the Beaver River Quarry provide a glimpse into the technologies and patterns. The Beaver River site, unfortunately damaged by Alberta Transportation just prior to its designation, is just one of a limited number of large quarry/workshops on the Beaver River identified in this study, many of which are intact and reported on elsewhere in this report. Coincidentally, these sites fall within the provincially designated site of the Beaver River Quarry and are therefore conserved for future study and interpretation of this unique and very significant part of the Native peoples' prehistory in the northeastern Boreal forest, which has been set aside by Syncrude and designated by the Government of Alberta as a Provincial Historic Resource for the benefit of present and future generations.

## 5. SUMMARY AND CONCLUSIONS

The study area, Syncrude Lease No. 22, is approximately 196 square kilometers. The lease may be subdivided on a physiographic basis into three components including the Clearwater Plain including the Beaver River drainage, the Dover Plain and the drainages of the MacKay and Dover rivers. Archaeological survey involving foot traverses and intensive shovel testing was carried out on each of the components in about equal proportions. Thirty-two prehistoric sites were identified. This complements six prehistoric sites previously known to be present within the study area (HgOv-29, 31, 32, 50, 51 and 54).

The objectives of this study were to provide a comprehensive survey of areas exhibiting potential for historical resources and to single out significant resources which would require mitigation, should development ever take place. Preparatory to the survey, known associations for prehistoric sites in the region were identified. These formed the basis for stratifying the lease. The stratification was accomplished using existing maps of soil distribution, relief and vegetation. The study plan involved a mapping of the features of interest identified in the course of prefield studies. On the advice of the Archaeological Survey of Alberta, these were expanded in the field to include areas which exhibited vegetation suggestive of relief on the assumption that they were well drained. Examination of the latter represents a sampling of such features within the study area. Examination of other identified areas of archaeological potential was more or less comprehensive with respect to the lease.

Subsurface examination represents a sampling of the features of interest. Seven thousand six hundred eight systematic shovel tests were tabulated as part of the systematic shovel testing program. By way of comparison, the area of study is approximately three times that surveyed for the adjacent Alsands project (Ronaghan 1981c) and 1.6 times the size of that surveyed for the nearby Canstar project (McCullough and Wilson 1982). Taking only purposefully placed tests, the Canstar Project placed 1.7 times the number of tests per square kilometer, while the Alsands program resulted in the placement of 2.29 times the number of tests per square kilometer. In part, this reflects the extensive distribution of muskeg within the Syncrude study area.

The results of the testing program at Canstar include the discovery of one site for each 618 tests, at Alsands the discovery of one site for each 208 tests and at Syncrude, one site for each 304 tests. Sites found in exposures, rather than shovel tests, reflect both the extent of existing exposure and the nature of the underlying sediments for each of the respective project areas. Leaving aside sites identified in exposed areas, sites identified in shovel tests at Canstar numbered 22, at Alsands 19 and at Syncrude, 25. If corrected to a standardized level of effort, the density of sites at Canstar would equal 0.10 sites per square kilometer, at Alsands 0.16 sites per square kilometer, and at Syncrude 0.14 sites per square kilometer. This approaches the author's perception of expected site densities for the three study areas and is, in general, likely to be a reliable estimate of their relative potential and value.

Within the study area, 64% of sites of high archaeological value (N=7) and 25% of those of moderate archaeological value (N=5) were identified within the immediate vicinity of the Beaver Creek Quarry (HgOv-29) and likely constitute an extension of this complex. In this context, prehistoric site distribution within the Syncrude Lease is considerably more clustered than in either the Alsands or Canstar leases.

An additional 11 prehistoric sites were identified within the immediate vicinity of drainages where they intersect the escarpment separating the Clearwater from the Dover Plain. This also contrasts sharply with the relative extensive distribution of prehistoric sites at both Canstar and Alsands.

The size of artifact collections recovered from site testing also differs for the three project areas. In general, the prehistoric resources of Syncrude are more productive. Sixteen of the prehistoric sites identified within the Syncrude Lease yielded more than 10 artifacts (Table 4) and eight of these yielded in excess of 100 artifacts. By way of contrast, at Canstar only three sites produced more than 10 artifacts with HlOw-8 on Calumet Lake yielding the highest number (N=45). On the other hand, at Alsands more than 10 sites yielded more than 100 artifacts. In general, the productivity of Alsands sites is comparable to that of Syncrude sites.

In terms of tools recovered, Alsands has proven to be the most significant of the project areas. A total of 251 tool and/or tool fragments were recovered including two projectile points, two rare microblade cores, a variety of bifaces (N=17), scrapers and hammerstones. Three tools were recovered from the Canstar Project area (McCullough and Wilson 1982). By way of comparison, nineteen tools were recovered from the Syncrude study area (Table 5).

Given that the effort within the Syncrude study area was extensive with respect to the lease and intensive with respect to features of archaeological potential, there appears to be a real, and significant, patterning of site distribution. What remains within the study area at large is below the "threshold of visibility" (McCullough and Wilson 1982). Given this, additional inventory is, in our opinion, not warranted.

TABLE 4: LITHIC DEBITAGE FREQUENCY BY SITE

| | Core/Core Fragment | Primary Decort. | Secondary Decort. | Core Reduction | Ridge | Retouch/ Resharp | Thinning | Shatter | Block Shatter | Split Pebble | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| HgOv-50 | | | | | | | | | | 1 | 1 |
| -29 | 13 | 2 | 1 | 16 | | 3 | 2 | 30 | 27 | | 94 |
| -31 | 6 | 5 | 34 | 101 | 15 | 3 | 1 | 1 | 22 | | 188 |
| -32 | 6 | 6 | 9 | 12 | 1 | 1 | | 1 | 7 | | 43 |
| -56 | 11 | 1 | 1 | 5 | | | | | 5 | | 23 |
| -57 | | | | 3 | | | | | 1 | | 4 |
| -58 | | | | 3 | | | | | | | 3 |
| -59 | 3 | 18 | 85 | 110 | 11 | 18 | 13 | 1 | 37 | | 294 |
| -60 | 6 | 2 | 3 | 14 | | | 24 | 6 | 6 | | 61 |
| -61 | 1 | | | | | | | | 1 | | 2 |
| -62 | 1 | | | | | | | | | | 1 |
| -63 | 9 | 10 | 91 | 79 | 6 | 3 | | 12 | 15 | | 225 |
| -64 | 24 | 3 | 52 | 174 | 8 | 62 | | 97 | 23 | | 443 |
| -65 | 13 | 1 | 32 | 307 | 5 | 164 | | 112 | 15 | | 649 |
| -66 | | | | | | | | | 1 | | 1 |
| -67 | 3 | | | 5 | | | 1 | 1 | 2 | | 12 |
| -68 | 1 | | | | | | | | | | 1 |
| -70 | 16 | 5 | 78 | 203 | 8 | 39 | | 50 | 20 | | 419 |
| -71 | 2 | | | 2 | | | 3 | 1 | | | 8 |
| -72 | 18 | 2 | 7 | 34 | | | | 50 | 12 | | 123 |
| -73 | | | | 4 | | 1 | 4 | 1 | | | 10 |
| -74 | | | | | | | | | | 1 | 1 |
| -75 | 6 | 1 | 4 | 4 | | | 1 | 2 | 5 | | 23 |
| -76 | 1 | | | 2 | | | 2 | | 2 | | 7 |
| -77 | 1 | 2 | 2 | 28 | | 3 | 1 | 1 | 19 | | 57 |
| -78 | | | 1 | 1 | | | | | | | 2 |
| -79 | | | | 2 | | | 1 | 1 | | | 4 |
| -81 | | | | 1 | | | | | | | 1 |
| HgOw-04 | 1 | | | | | | | | | | 1 |
| -05 | 5 | 9 | 65 | 36 | 2 | | | | 1 | | 118 |
| -06 | 1 | | | 4 | | | 1 | | | | 6 |
| -07 | | 1 | | | | | | | | | 1 |
| HhOw-06 | | | | | | | | | | 1 | 1 |
| TOTALS | 148 | 68 | 465 | 1150 | 56 | 297 | 54 | 367 | 219 | 2 | 2827 |

NOTE: HgOv-55, 69 and 80 - tools only

TABLE 5: TOOL FREQUENCY BY SITE - SYNCRUDE LEASE 22

| | RETOUCH UTILIZED FLAKE | RETOUCH UTILIZED PEBBLE | RETOUCH UTILIZED CHERT | SCRAPER | UNIFACE | BIFACE BIFACE FRAGMENT | TOTALS |
|---|---|---|---|---|---|---|---|
| HGOV-29 | | | | | 2 | | 2 |
| HGOV-31 | 1 | | | | | | 1 |
| HGOV-55 | | | 1 | | | | 1 |
| HGOV-57 | | | | 1 | | | 1 |
| HGOV-58 | | | | 1 | | 1 | 2 |
| HGOV-59 | 2 | | | | | | 2 |
| HGOV-64 | | | | | | 1 | 1 |
| HGOV-65 | 1 | | | | | | 1 |
| HGOV-69 | 2 | | | | | | 2 |
| HGOV-70 | | 1 | | 1 | | 2 | 4 |
| HGOV-80 | | | 1 | | | | 1 |
| HGOW-05 | 1 | | | | | | 1 |
| TOTALS | 7 | 1 | 2 | 3 | 2 | 4 | 19 |

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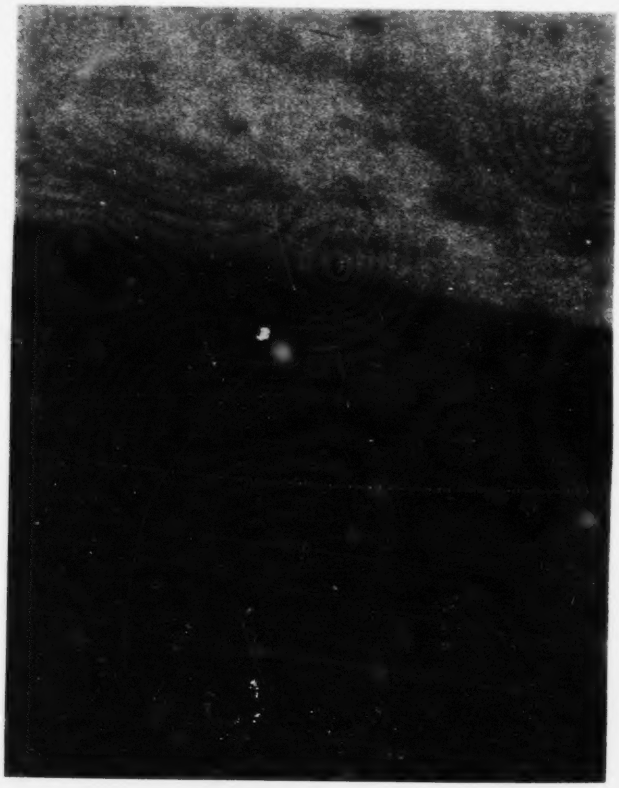


Plate 1: Athabasca River shoreline with Morton Island in foreground.

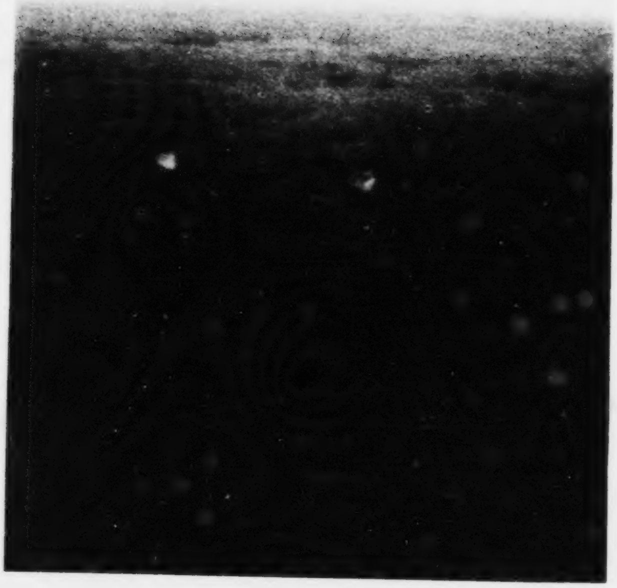


Plate 2: MacKay River, view north.

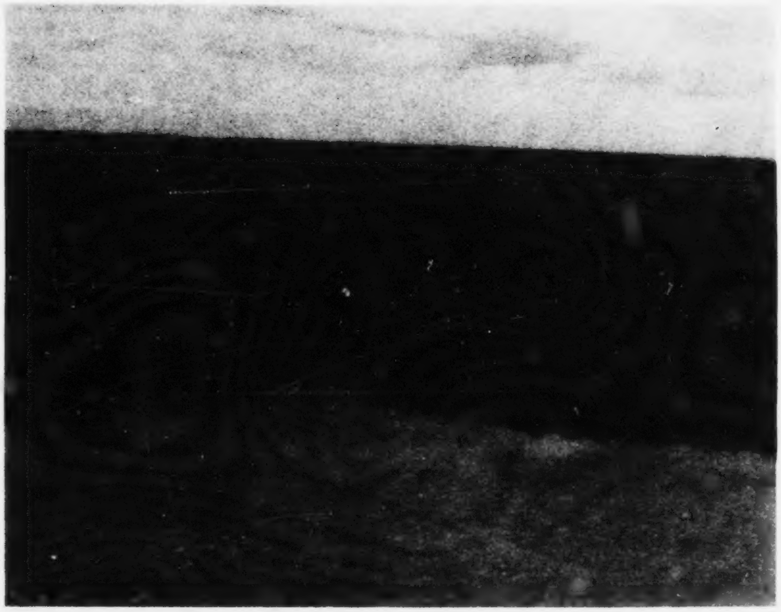


Plate 3: MacKay River confluence, view west.

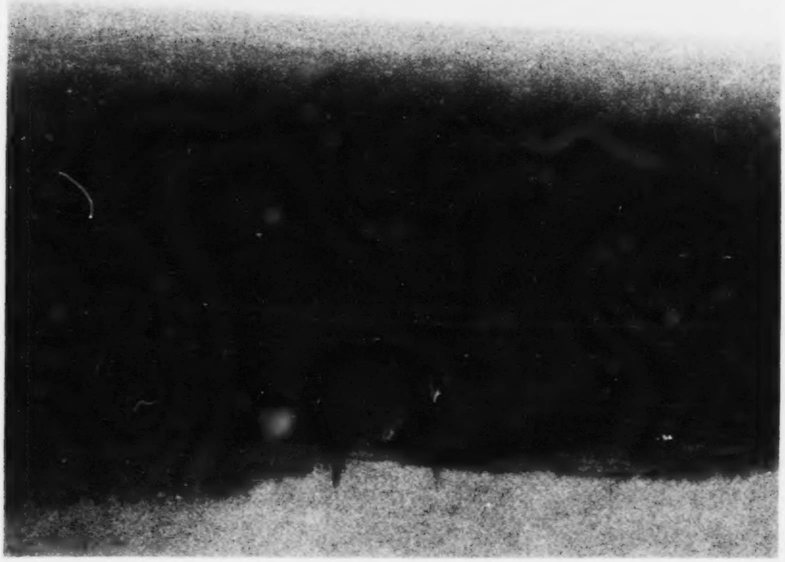


Plate 4: Beaver River confluence, view west.

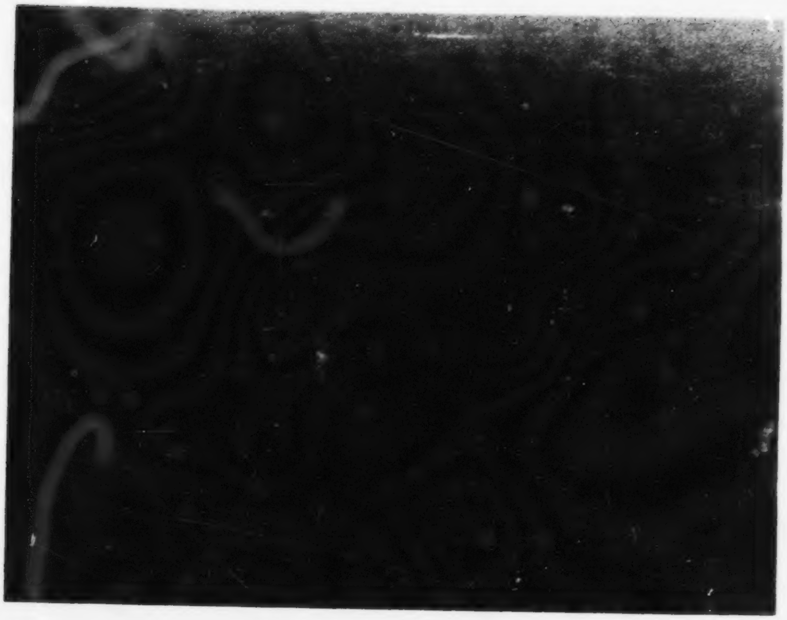


Plate 5: Dover River, view south.

Plate 6: Beaver dammed ponds.

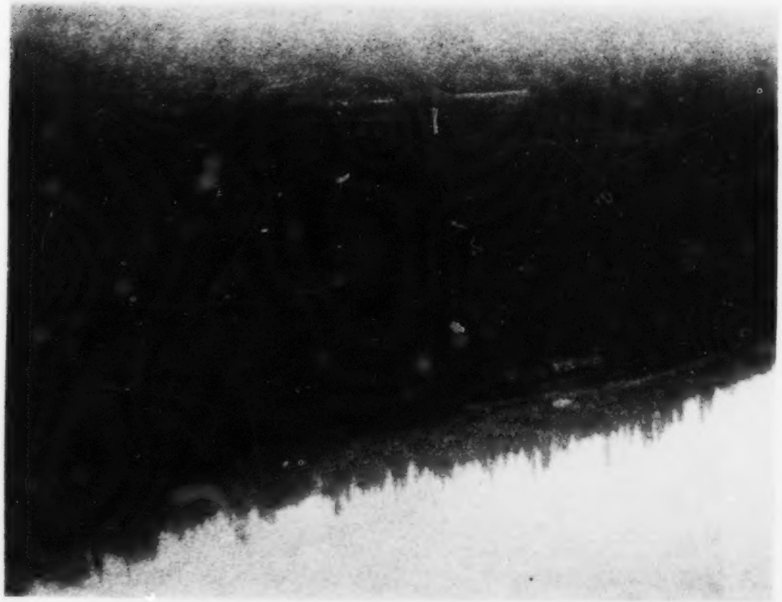


Plate 7: Limestone ledge on Athabasca River, view northwest.

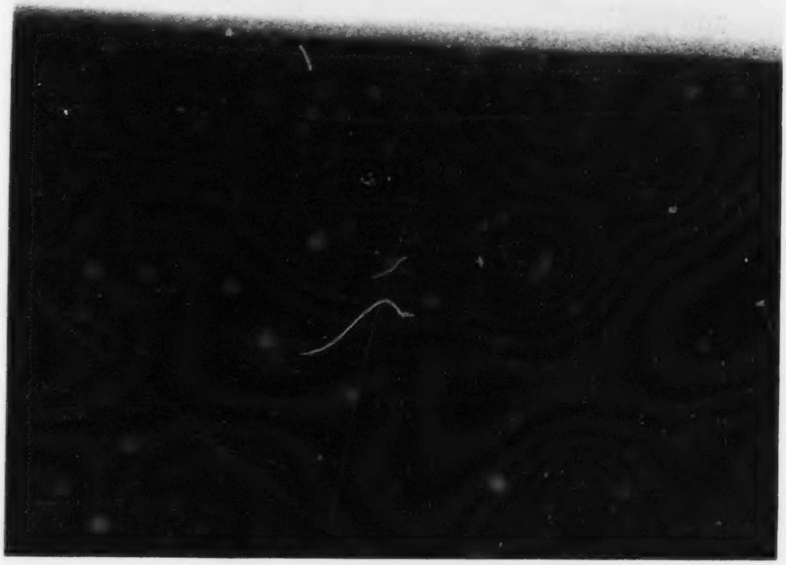


Plate 8: Vegetation (aspen) isolate (light coloured linear feature in centre of photograph) of the kind investigated in an attempt to locate areas of relief not mapped on existing contour maps.

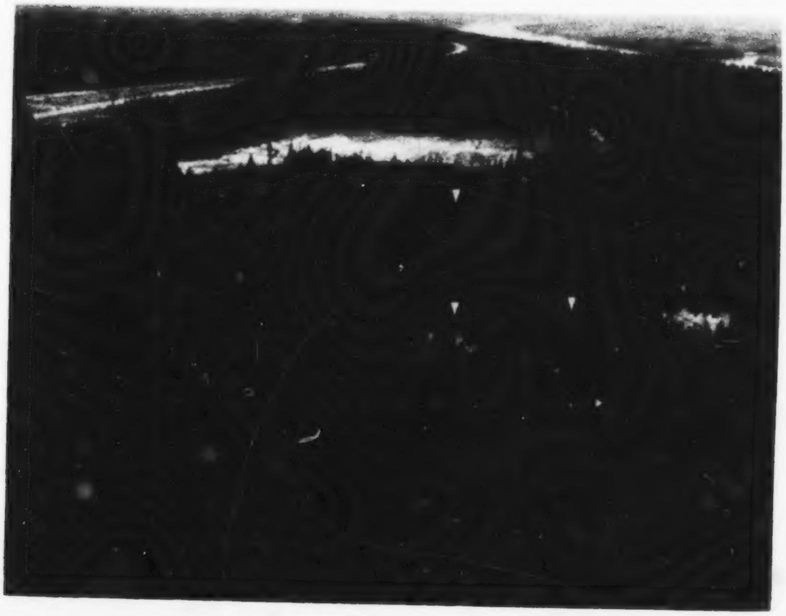


Plate 9: Clockwise from top left are HgOv-51, HgOv-29 and HgOv-56.

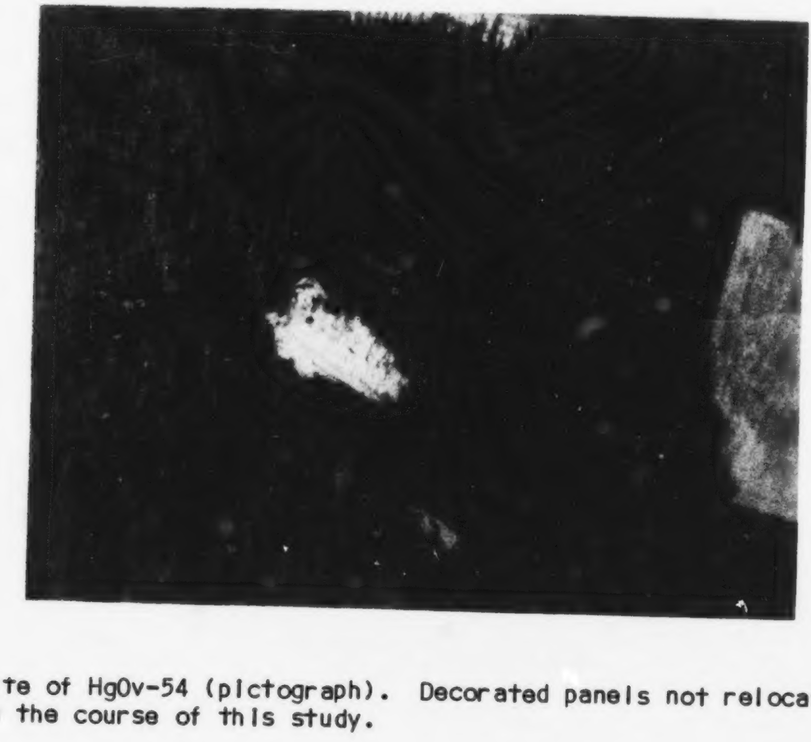


Plate 10: Site of HgOv-54 (pictograph). Decorated panels not relocated in the course of this study.

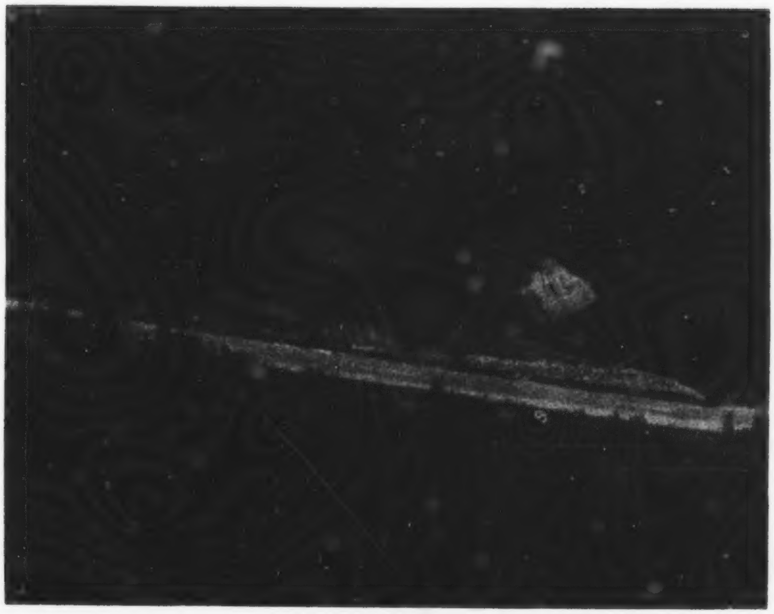


Plate 11: View of HgOv-31 (east) towards Athabasca. HgOv-29 and borrow pit are located at extreme upper left of photograph.

Plate 12: HgOv-50 at base of bridge and along Athabasca shoreline to left of photograph.

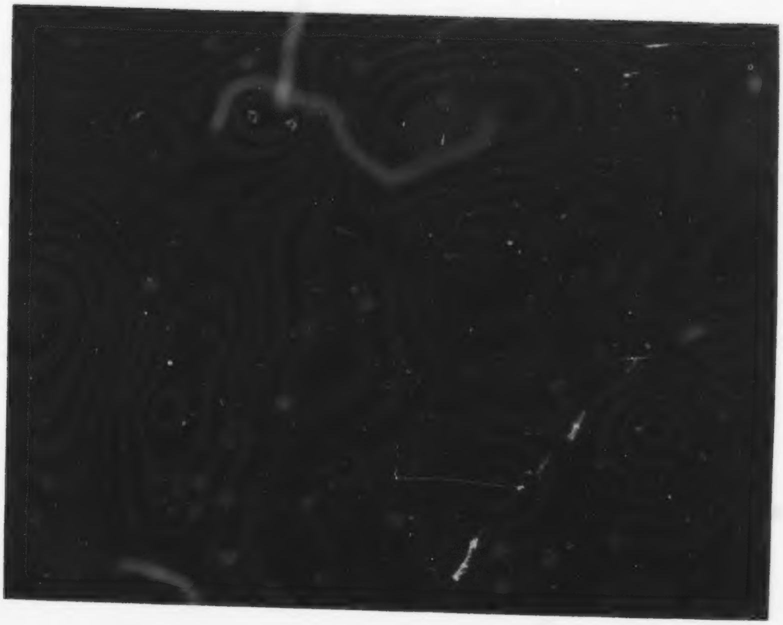


Plate 13: HgOv-63 on terrace of Beaver River at left centre of photograph.

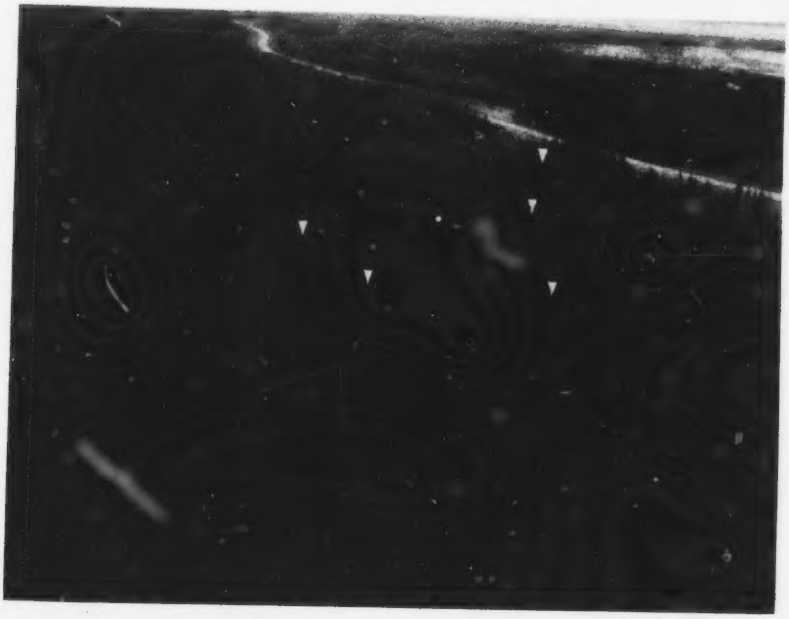


Plate 14: Clockwise from top right are HgOv-72, HgOv-32, HgOv-64, HgOv-70 and HgOv-65. View to southwest.

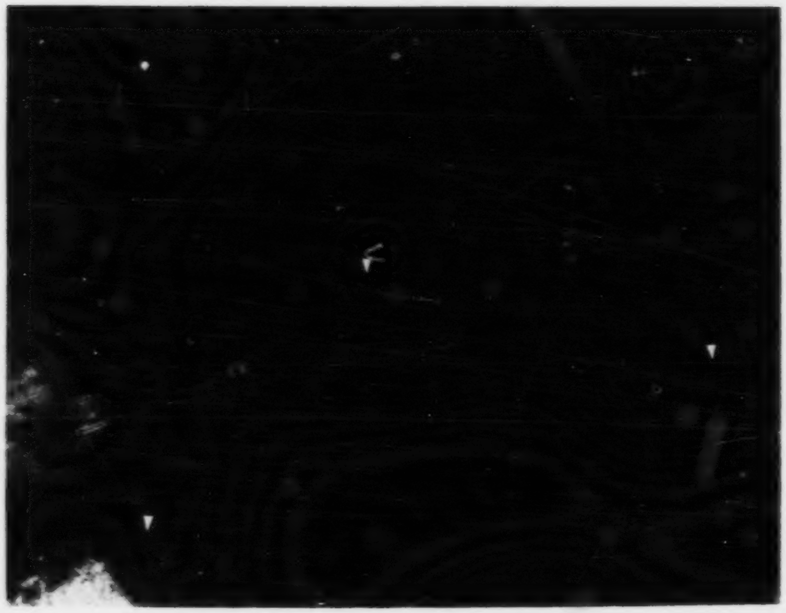


Plate 15: Clockwise from bottom left (view northwest) are HgOv-59, HgOv-60, and HgOv-58.

Plate 16: View of artifactual concentration in HgOv-59 along edge of exposed borrow pit.

Plate 17: Historic use at HgOv-59, view towards west.

Plate 18: View east of HgOw-5. Artifact distribution lies at bottom and along left side of treed knoll at centre.

Plate 19: HgOv-55 aerial oblique view to northeast. Site is located in cleared area at centre of photo.

Plate 20: HgOv-57 view west. Site located immediately to the right of cutline at centre of photograph.

Plate 21: HgOv-61 (approximate location), view to the northeast with borrow pit in centre background.

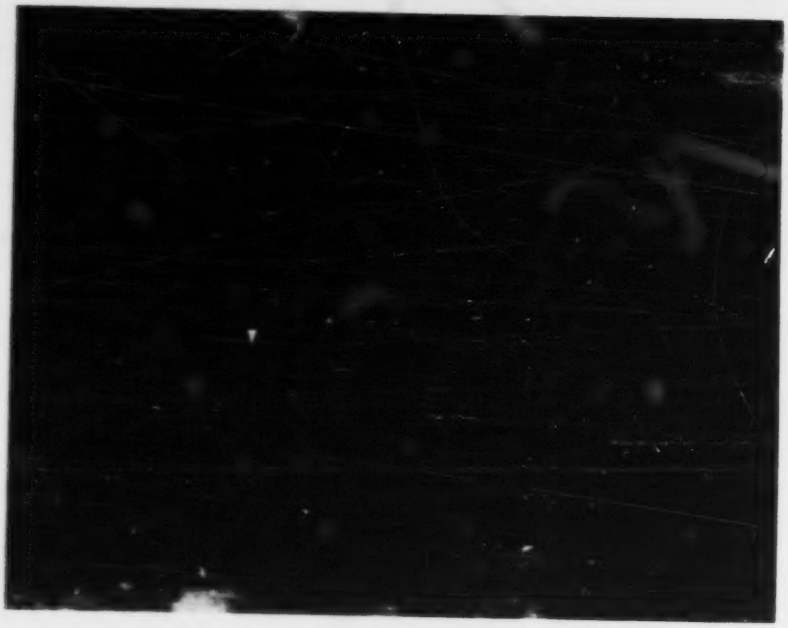


Plate 22: HgOv-62 located to west of HgOv-61, view to the north with borrow pit at top background.

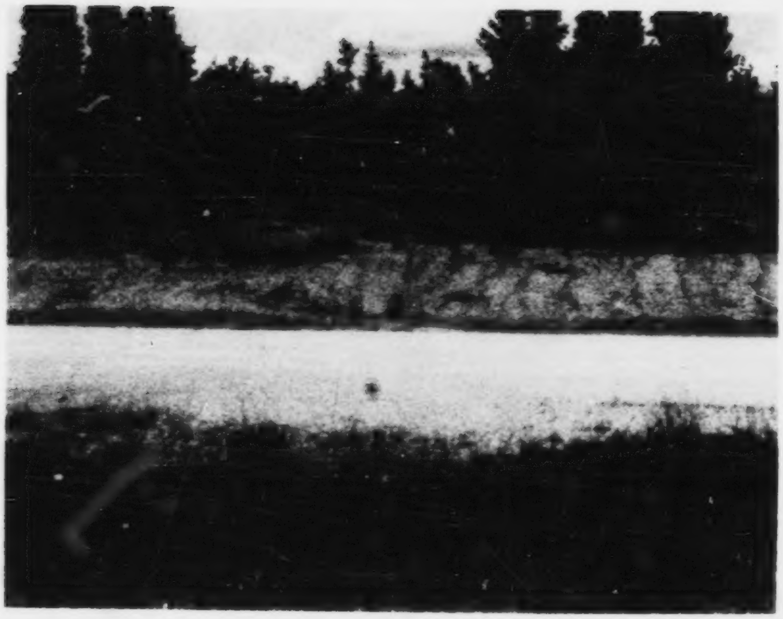


Plate 23: View east of HgOv-79 on east side of MacKay Road.

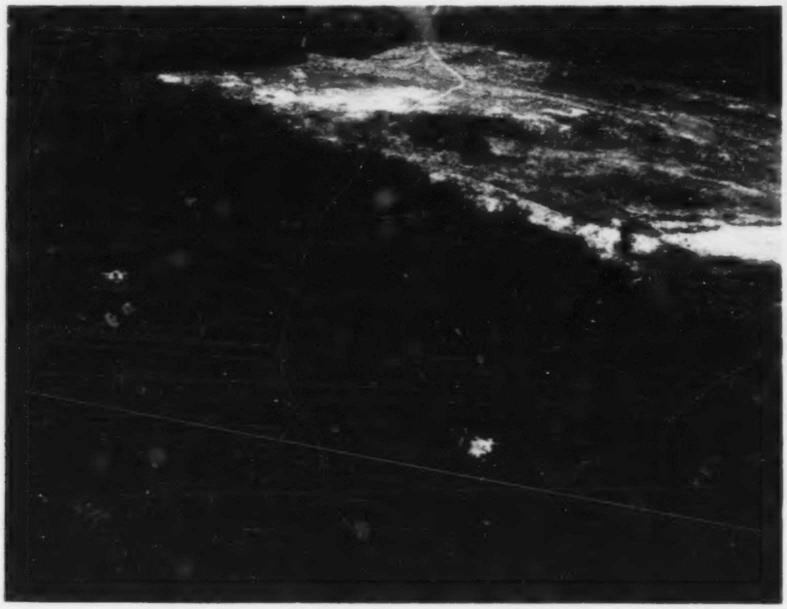


Plate 24: View northwest of HgOv-80 at centre of photograph below road and left of borrow pit.

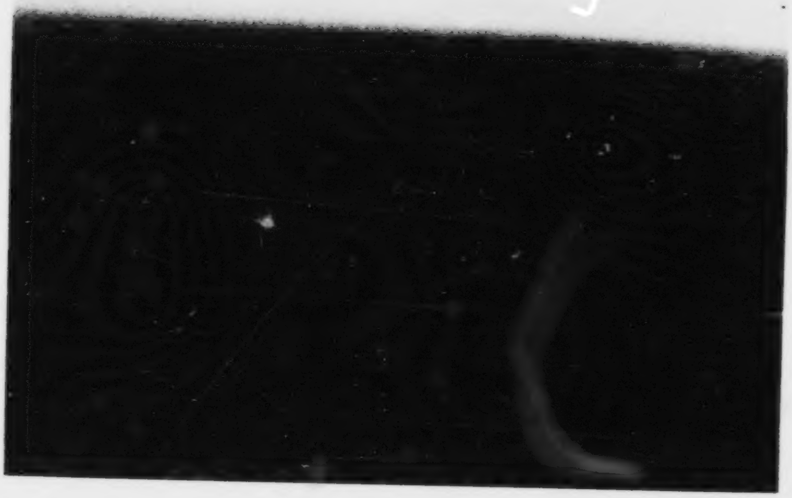


Plate 25: View north of peninsula on which HgOv-81 is located.

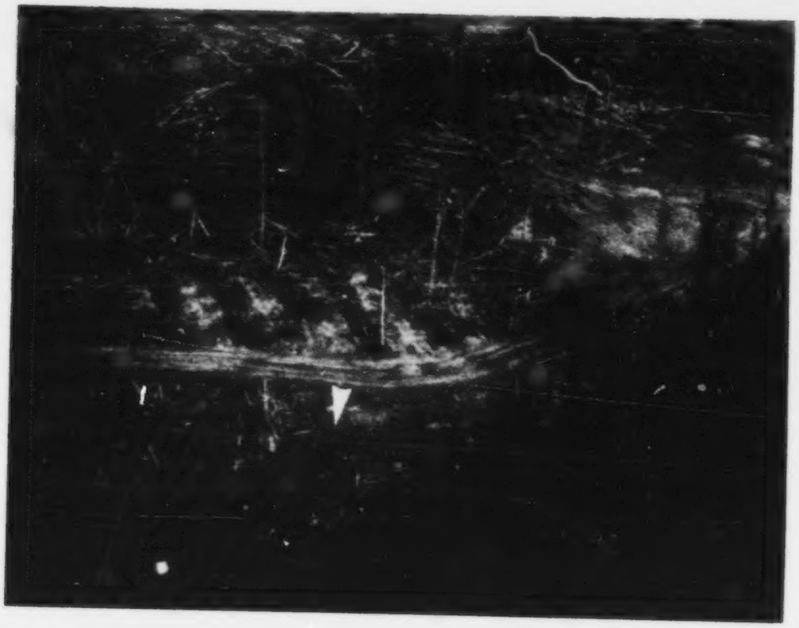


Plate 26: HgOw-6, view towards southeast with drainage at top of photograph.

Plate 27: HgOw-7, view towards northwest with drainage in foreground.

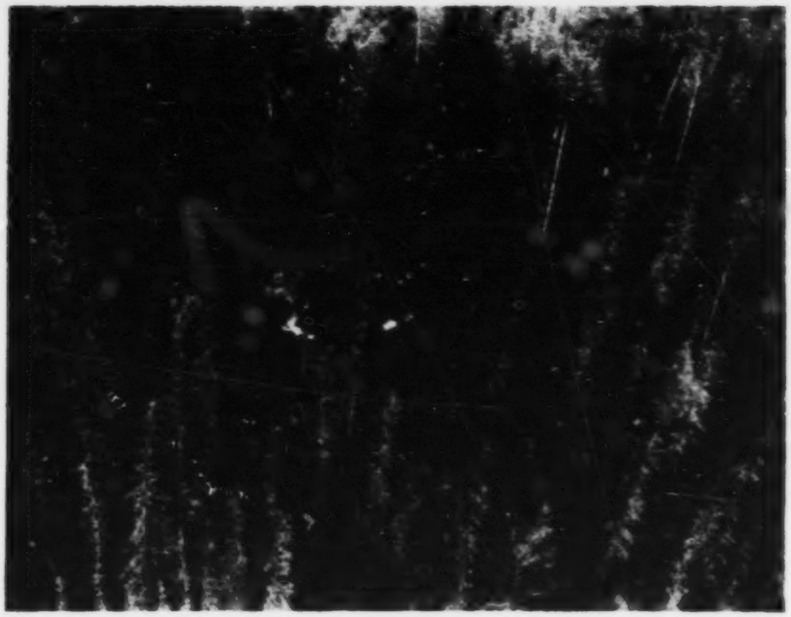
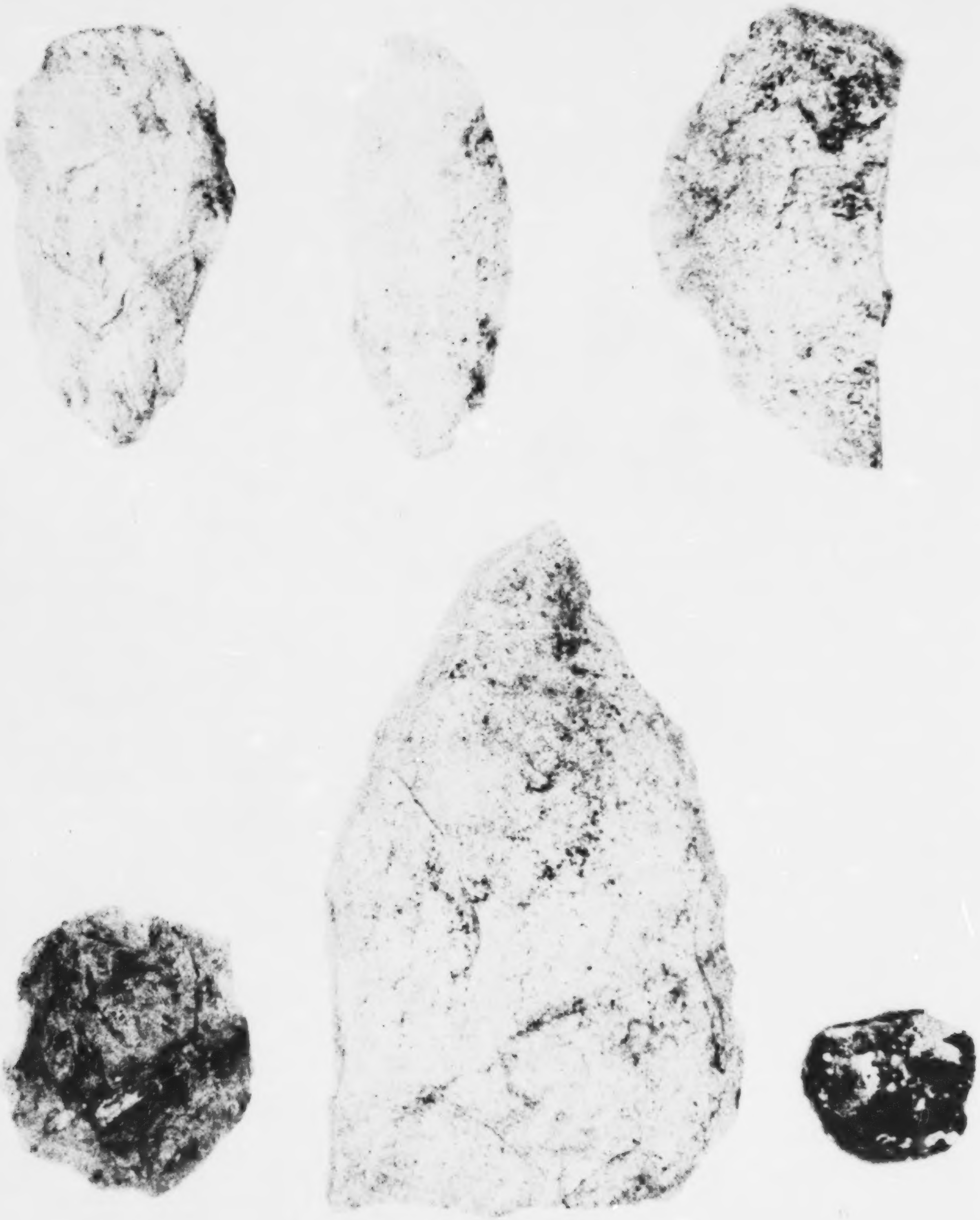


Plate 28: Typical cabin site (H2), view towards northwest.

Plate 29

1. Beaver River Sandstone uniface (HgOv-29:680)
2. Beaver River Sandstone biface (HgOv-58:1)
3. Beaver River Sandstone biface fragment (HgOv-70)
4. Beaver River Sandstone uniface (HgOv-29:608)
5. Beaver River Sandstone scraper (HgOv-70:421)
6. Quartzite scraper (HgOv-58:2)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# METHODOLOGICAL OVERVIEW APPENDIX 1

## Non-Probabilistic Sampling

Historically, archaeologists have relied heavily on non-probabilistic sampling designs. Lake shore, beach, and river surveys, for example, have played a significant and continuing role in archaeological research, particularly in scholastic studies. In general, surveys of this type are referred to as judgemental surveys. Judgemental surveys have resulted in relatively good site inventory yields per unit of time. Further, a relatively high proportion of the sites located in this manner have been found to be relatively significant according to the criteria of size, stratification, and content. There are sound logical and theoretical reasons for this fact. We believe the prehistoric native located settlements at locations which were, from some standpoint, favorable. This locational quality resulted in repeated usage by members of the same population and sequent populations. Judgemental surveys focus on these same areas. By and large, the most preferred locations for the prehistoric native were immediately accessible from routes of travel--rivers, for example. Archaeological surveys are carried out along these same routes as they are easily accessible, thus resulting in the discovery of a high frequency of 'preferred' locales. From the standpoint of the archaeological sciences, the critical failure is not concerned with the survey procedure, but rather with the failure of the archaeologist to provide a meaningful statement of the predictive model which structures the survey. Generally, the model is based on an implicit understanding of ethnographic land use according to extant summaries. In the absence of a described survey structure, the information on settlement patterns is of limited utility.

Dr. Paul Donahue's survey of the Clearwater and Athabasca rivers is a good example of a judgemental sampling design (1976b). The design initially involved a rapid examination of the river shorelines, and bedrock and alluvial terraces. The examination of the latter was abandoned when it became apparent that they did not contain sites. "All likely looking places, as determined by physiography and/or vegetation, were surface surveyed and trowel tested . . . ." (ibid.). The reconnaissance survey was initiated 6.4 km above the confluence of the Christina and Clearwater rivers. Eleven stops were made along the river traverse and two prehistoric sites were located. Along the Athabasca a 45 km stretch was examined. This examination involved 26 stops with the result that 12 prehistoric sites were located. The parameters of predicted site locations--stops--are not reported in detail. The conclusion of the study was that prehistoric sites on the Clearwater were associated with bedrock terraces and those along the Athabasca were associated with well-drained terraces (ibid., p. 47).

John Pollock's judgemental reconnaissance survey of the Clearwater River area was similar in nature, but more detailed in application. Pollock also restricted examination to "habitable" locations. He lists the kinds of areas examined. These include "predominantly high river bank terraces, on sandbanks, within sheltered bays, on points of land, or on islands" (Pollock 1978:26). He also notes that portages are good locations (ibid.). Thirty archaeological sites were located during the reconnaissance. The level of effort, however, was more than 15 times as great as that expended by Donahue.

Opportunistic samples, in their purest form, avoid locational prediction altogether. Instead, strategies of this type are designed to maximize site discovery by means of examining all available exposures (e.g., eroding banks, tree throws, animal burrows, and areas of cultural disturbance such as cutlines, roads, drill pads, mining sites, and campsites). Normally, opportunistic sampling is carried out in conjunction with a judgemental strategy in order to lessen the required level of effort.

Sims' reconnaissance survey of Shell Lease C-13 is illustrative of an opportunistic survey (1975). In Sims' discussion of methodology, he states that the ". . . initial observation included examination of existing exposures created by current and previous transportation corridors along the Muskeg River, as well as those resulting from clearing for airstrips, the construction camp, and drilling sites . . . ." (ibid., p. ix). The level of effort expended was biased judgementally towards areas of greatest environmental diversity--the western half of the lease, the Muskeg River, and Hartley Creek.

Forty-seven prehistoric sites were identified in Sims' study. Eleven of these sites were designated as small finds or "possible sites." Two additional sites were located on the Home Oil Lease #30. The project involved two people working for 8-10 days (Reardon 1981:personal communication).

The reported archaeological sites were found to be clustered along the Muskeg River, Hartley Creek, and the Athabasca River. Areas of high potential for the lease at large were calculated on the basis of a model developed for a previous study (Syncrude 1973). According to the model, the areas of highest potential were assumed to be those which exhibited the greatest environmental diversity. In his conclusion, Sims provides a prediction of the archaeological site density for the lease at large. The prediction is based on a simple extrapolation of the known data to areas from which sample data had not been recovered. According to the prediction, 185 prehistoric sites would be expected for the lease (Sims 1975:52).

Systematic sampling, per se, has not been applied within the region. It would involve the examination of locations at fixed intervals, regardless of their judgemental potential or the availability of exposures. It would have been instructive had such a program been carried out in the Alberta Oil Sands region in that one might compare the results of such a program with the results of other programs which have been carried out to date.

Even a brief examination of the archaeological and statistical literature, however, indicates that systematic sampling has uncorrectable faults which, at the level of regional survey, make it a poor strategy for sampling. One problem, for example, is the potential for periodicity in site locations. Should the chosen fixed interval of the sample miss one site, given a periodic function of site location, all subsequent sample units would also miss existing sites. The only remedy for this failure would be to reduce the interval between sample units sufficiently to provide, more or less, complete coverage. Such a sample, however, would be too costly for practical consideration.

In summary, non-probabilistic sampling of the types discussed above have both advantages and disadvantages. In the archaeological literature such methods have been characterized as methodologically slovenly. The major weaknesses are that they are biased, unstructured and unstated. The former is acknowledged by all archaeologists, but balanced by the fact that they are, for a given level of effort, quite productive. On the other hand, this bias in a regional framework, results in a data base which is weighted towards the inventory of a specified kind of site--seasonal or functional. It was this element of judgemental survey, for example, which led Binford (1964) to consider the use of probability samples designed to generate reliable and representative samples of archaeological site types within a region. The latter criticisms are easily correctable and, therefore, moot. Contemporary archaeologists have adopted these criticisms primarily to buttress their posture as scientists. In fact, many contemporary studies fail to provide adequate documentation or explanation of the structure of their probabilistic samples.

The case studies discussed above illustrate the basis for criticisms nicely. There is a general failure among studies in the oil sands region, with one exception, to provide the theoretical or logical basis for the sampling plan adopted. There is a failure to report, exactly, what was looked at, why it was looked at, and the level of effort expended to do the survey. These criticims are, for the most part, easily correctable. A recent study carried out on the Alsands Lease (Ronaghan 1981a) attempts to thwart the major criticisms by providing and describing a sound basis for the methodology employed. It also attempts to put forward a primarily judgemental design which is, in part, compatible with probabilistic designs discussed below. As the Alsands methodology proved to be relatively successful, we will turn to it again in a later section of this overview.

## Probabilistic Sampling

Probabilistic sampling tends to be elegant, precise and designed to provide reliable estimates of a number of parameters of a population. Probabilistic sampling suffers, as do systematic samples, from a general disregard of known facts. While there are means by which to incorporate certain data into a probabilistic sampling design (stratification of the sampling universe and weighted samples), naive designs generally fail to focus the level of effort in a manner designed to maximize the site discovery ratio.

A classic case of a probabilistic design which fails to incorporate previously acquired data happens to have been utilized in the Alberta Oils Sands region (Losey and Conaty 1980). As this example was a major program which involved almost 500 man days, it is particularly instructive. The study area--20.75 square miles--had been previously examined judgementally (Sims 1975). The adopted design was purely probabilistic in the sense that no stratification was attempted. The distribution of the sample units was weighted only according to the area of each of the proposed developments in order that no particular area would be underrepresented.

The study area was subdivided into quadrats, each 1/8 square mile (ca. 0.41 ha). Thirty percent of the quadrats and a sample interval within each of the quadrats was selected randomly. The sample interval was arbitrarily constrained to a number between 100 and 300 feet. This resulted in the excavation of a minimum of four and a maximum of 41 tests per quadrat. As there was no judgemental bias, all sample units were tested. The only constraint on sampling was that when the excavational test filled with water it was abandoned. Because the sampling area included large areas of muskeg, a considerable number of units were ultimately abandoned. Similary, because so much of the area was also forested and lacked exposures, site discovery was based almost wholly on the test excavations. In effect then, the sampling fraction rather than being 30%, approximated 0.004% of the study area. With such a low sampling fraction, any resultant prediction would be suspect.

Two prehistoric sites were discovered during the sampling phase of this program. Additional sites were, however, found judgementally. On the basis of these findings, the investigator calculated that at a maximum 81 prehistoric sites and a minimum of no sites (sic) would occur. Although the statistics of this calculation--which appear to be simple extrapolation rather than statistical--were not reconstructed, the wide variance of the estimate suggests that the predictor is of very low power, if not totally spurious.

It should also be noted, before leaving this discussion, that the probabilistic design here was not concerned with locational correlates, only with the question of site density.

Historical Resources Impact Assessment by Fedirchuk McCullough & Associates Ltd. of the Canstar Bituminous Sand Leases (McCullough and Wilson 1982), also conducted both a probabilistic and non-probabilistic sampling scheme. Areas of unknown archaeological potential were randomly sampled to eliminate potential fortuitous periodicies which might occur in the population. Quarter sections were used as the sampling units. Only sampling units containing at least 50 percent well-drained terrain were chosen as part of the sample universe. An arbitrary decision was made to sample 45 percent of the 67 sampling units of unknown potential and the requisite number of units were selected by replacement. Ground visibility within the investigative units was virtually non-existent due to the dense vegetation cover. To overcome the visibility handicap, a subsurface testing program utilizing test units, 50 centimeters in diameter, was implemented as a method of discovering historical resource sites concealed by vegetation and recent sedimentation. Less than 100 units were excavated in some sampling units because of wetland pockets. Of the thirty sample units investigated, thirteen units were systematically assessed using the linear transect method since the landscape within these units was relatively uniform.

Eight transects spaced at 100 meter intervals were utilized. The test interval was 100 meters, resulting in the excavation of 64 test units. A minimum of 36 judgmental tests were then excavated within each sampling unit to bring the total number of tests to 100 or more. The judgmental tests were placed along the transects to accommodate minor variations in the terrain within each unit.

The non-probabilistic survey investigated selected areas which had demonstrated the potential for prehistoric sites. These areas were the margins of lakes, sinkhole lakes, sloughs, rivers, creeks and other drainage features, ridges and knolls. The margins of Athabasca River were assessed utilizing five transects spaced 30 meters apart. Lake and creek margins were assessed using three transects similarly spaced. The transects and testing intervals along ridges and knolls and the kame complex varied to accommodate these topographic features.

Thirteen thousand five hundred sixty-seven shovel tests, 50 centimeters in diameter, were excavated in the study area with a success rate averaging one site for every 618.8 test units excavated. Thirty-nine prehistoric sites were recorded by the studies. Of these 38 sites were found by judgmental survey; one site was found by probabilistic survey of areas of unknown potential, despite the fact that 2,990 shovel tests were excavated.

## Methodological Evaluation

Our preliminary assessment of the methodologies employed in the Alberta Oil Sands region must be, due to time constraints, relatively brief. Our object has been to address points of concern rather than to provide precise evaluation. Our assessment has been further hindered by a lack of relevant data in the available reports. A number of the major studies, for example, fail completely to provide an accurate measure of the level of effort. Similarly, areas actually examined are, in many cases, not reported. In the following discussion two factors are considered--the efficiency of the program and the resultant data.

### Efficiency:

It has been suggested elsewhere that archaeological site discovery rates, regardless of methodology, are to a degree correlated with the number of person days employed within a unit of area (Plog 1978:32). Utilizing the six projects above--more or less representative of the types of programs carried out in the Alberta Oil Sands region--we have found that this correlation appears to have some value. Site discovery rates in the forest have always proved to be significantly lower per unit of time. Thus, the results of our comparisons are somewhat divergent from the example utilized by Plog and others (ibid.).

Figure 12 is provided for illustrative rather than statistical purposes. However, it can be readily seen that the trend here appears to be opposite that which is expected. A more careful consideration of the graph is warranted. If the expected trend were plotted a number of factors would become apparent. First, those studies exhibiting higher than expected yields contained a substantial opportunistic component. Those exhibiting lower than expected yields relied principally on shovel testing for site discovery. Those studies reporting results closest to the expected relied on purposeful but structured sampling.

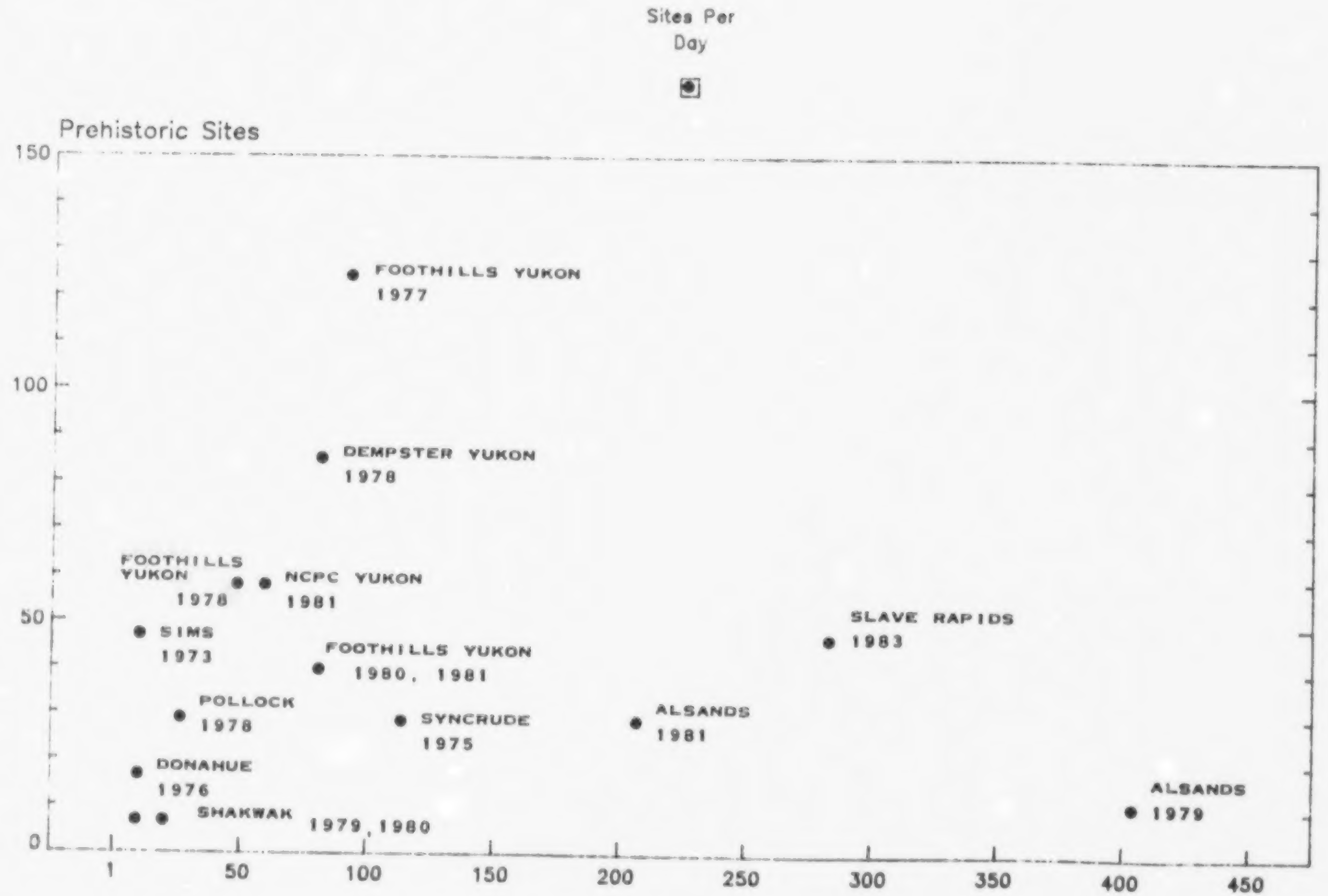
Regardless of the fourteen studies plotted, one yielded exceptionally high site discovery ratios (Sims 1975), while another (Losey and Conaty 1980) yielded an exceptionally low discovery ratio. In both cases these discrepencies are due to the methodology and/or operationalizing of the methodology and the nature of the area investigated. As both of these studies were concerned with the same lease, we have data which may account for the discrepancy.

As noted earlier, Sims' study was primarily opportunistic. It was concerned with areas where prehistoric sites were expected to occur on judgemental grounds--the Athabasca River terraces, the Muskeg River, and Hartley Creek (1975). Losey and Conaty's study, on the other hand, was primarily concerned with areas where prehistoric sites were expected to occur with less frequency. The probabilistic design forced the investigators to

FIGURE 12

Level of Intensity

Site Discovery



Selected Northern Projects

consider a large area where site discovery is difficult--wetlands. The inclusion of sample units located in muskeg, in our view, effectively halved the level of effort expended towards the discovery of sites on the lease. More than 61% of the excavated tests were located in wetlands or were completely inaccessible to the investigators. These facts alone, however, do not totally explain the low discovery rates. Subsequent studies involving similar areal constraints proved to be quite successful (Ronaghan 1981a, Ives 1982). The difference between Losey and Conaty's and later studies are largely attributable to the difference in the study objectives and the methodology employed to achieve those objectives.

The objective of Losey and Conaty's study was to determine the veracity of the judgementally determined site density predictions provided by an earlier study (Sims 1975) and to provide refined predictions to be utilized in future studies. This contrasts sharply with the objectives of Ronaghan's study where the primary objective was the discovery of as many prehistoric sites as was feasible using the allotted level of effort. This objective was entertained in order to conform to the requirements of the Historical Resources Act, which requires, during the conduct of an H.R.I.A., an inventory of all prehistoric sites. While the requirements of an H.R.I.A. are not in fact realizable or practical in most circumstances, an acceptable methodology must be designed so as to maximize site discovery rates given some structured basis.

Legal and practical considerations aside, the brief remarks above tend to lend support to the suggestion that there is considerable variability in site density between areas of differing environments. In order to account further for the poor results of the probabilistic study and to provide a basis for designing an acceptable archaeological survey of Syncrude Lease 22, we now turn to the assumptions and results of studies bearing on this inequality.

Locational Parameters:

Three studies within the Alberta Oil Sands region have centered on areas which might be referred to as "hinterland." Four other studies discussed above (Syncrude 1973; Donahue 1976b; Pollock 1978; Sims 1975), regardless of operational assumptions or methodology, have centered on areas of high archaeological potential--river banks, creeks, lake shores, and so forth. Each of these types of areas, viewed traditionally, and in ethnographies, are assumed to contain relatively high numbers of prehistoric sites. A brief examination of the known site distribution illustrates, without further analysis, the veracity of this assumption. Unfortunately, the known regional distribution of prehistoric sites is biased by the locations of past archaeological studies.

If prehistoric and historic site locations were a function of the distribution of these features, it would be a simple matter to predict archaeological site locations within Syncrude Lease 22. Archaeological sites are, however, known to occur away from water bodies, albeit in lower densities. Similarly, our knowledge of ungulate distribution and behavior suggests several factors which favor the exploitation of areas away from water bodies by the prehistoric inhabitants. Our problem then is to develop a set of expectations for hinterland areas which have been generally ignored in a traditional framework.

The four studies which have concerned themselves with hinterland areas--Losey and Conaty (1980), Ronaghan (1981a), McCullough (1980), and McCullough and Wilson (1982)--have all produced positive results, although of varying quality. As McCullough's study was relatively structured--linear areas of disturbance and well sites--it will only be discussed in conjunction with more areal studies. Losey and Conaty's study has been previously discussed in some detail and the positive contributions can be stated simply--prehistoric sites are not or cannot be found in wetlands.

During 1980, Ronaghan carried out further studies on the Alsands Lease which substantially altered our perception of the site locational behavior in areas away from water bodies. They are now known to exist in moderate numbers. The successful implementation of the program was the result of applying a more rigorous set of judgemental criteria to areas not normally examined by these means. By defining a set of sample units on the basis of micro-environmental features rather than gross geomorphic features, the level of effort was expended in an efficient manner. In general, the design tended to postulate that prehistoric sites, in all cases, are correlated with "nodes and alignments" which can be defined prior to implementation of an archaeological survey. While other prehistoric sites may exist, it is assumed that the majority of the sites will be so associated.

McCullough and Wilson's (1982) study on the west bank (i.e., Canstar) illustrates both the productivity of various methods directly as well as the generally lower site density of areas located away from pivotal quarry sites.

# APPENDIX 2

# HISTORICAL RESOURCES IMPACT ASSESSMENT
SYNCRUDE CANADA LTD. LEASE NO. 22
ASA PERMIT NO. 84-53
DETAILED STUDY PLAN
(PART III TO PERMIT APPLICATION)

# 1. STUDY PLAN

The Syncrude Canada Ltd. Lease No. 22 is approximately 196 square kilometres. As outlined in our proposal, "Historical Resource Survey, Syncrude Lease No. 22", the basic strategy adopted for the conduct of the Historical Resources Impact Assessment is one of prequalifying the study area according to its archaeological potential (i.e., stratification). Operationally, this permits us to limit the scope of the project to those areas with demonstratable archaeological potential. The given level of effort would then be focused; thus increasing the intensity of survey within areas of archaeological interest. The theoretical and methodological basis for the prequalification is discussed at greater length in our proposal for the study.

Information used for constructing the sampling plan includes both cultural and biophysical data. Existing biophysical data is limited to the following:

- 1:250,000 scale mapping of surficial geology (Bayrock 1971)
- 1:50,000 scale mapping of vegetation, surficial geology and soils (AOSERP, Ecological Habitat Mapping of the AOSERP Study Area, Phase I)
- 1:20,000 scale mapping of organic (muskeg) deposits between the MacKay River and Highway 963 (Syncrude Canada Ltd. 1982/1983)
- 1:20,000 scale, 2 metre contour mapping of the study area (Syncrude Canada Ltd. 1981)
- 1:20,000 scale aerial photography of the study area.

Cultural data available for the sampling program include the location of prehistoric and historic sites, ethnographic and historical models of site distributional patterns and archival data bearing on the location of nineteenth century historical sites. This literature is cited in our proposal and/or in various monographs and reports stemming from past archaeological research within the Oil Sands Region.

## 1.1 SAMPLING DESIGN

### 1.1.1 Objectives

The objective of the sampling design component of the study is to identify and map areas with moderate to high archaeological potential so as to define the requirements for field studies.

### 1.1.2 Study Plan Construction

The study plan (attached) is based on a consideration of the performance of various styles of archaeological survey previously employed in the Oil Sands Region with respect to available geographic, geomorphic, pedological, and biological data. The more successful of previous studies are those which included a significant, purposeful component (e.g., McCullough and Wilson 1982, Ronaghan 1981a, Ives 1982).

In McCullough and Wilson's study (1982) prehistoric sites were found to be associated with geographical features including lakes, sinkholes, the shoreline of the Athabasca River, stream banks and similar definable features. In Ronaghan's study (1981a), prehistoric sites were found to be associated with knobs, ridges, and escarpments as defined by soil types. In the latter case, however, it was found that vegetation, terrain and soil type were closely correlated. In essence, archaeological sites were found to be associated with well-drained locations.

The first task in the preparation of the study plan was to map areas which would be potentially included within the scope of the study by virtue of its drainage characteristics. This was accomplished using pedological and muskeg distribution maps.

## 1.1.3 Scope

Between the MacKay River and Highway 63, potential sampling areas were mapped directly from Syncrude Canada Ltd.'s Muskeg and Terrain Analysis, 1982/1983 Muskeg Volume Study. For the remainder of the study area, potential sampling areas are inferred from 1:50,000 soils mapping (Alberta Oil Sands Environmental Research Program 1978).

### 1.1.3.1 Muskeg Volume Study

Syncrude Canada Ltd. mapping of the area between the MacKay River and Highway 63 at a scale of 1:20,000 consists of five study units. These include:

- Muskeg and Peat Beds (greater than 2.0 m)
- Muskeg and Peat Beds (between 0.5 m and 2.0 m)
- Muskeg and Peat Beds (less than 0.5 m)
- Drainage Channels (greater than 0.5 m)
- Nonorganic, primarily glaciolacustrine deposits with areas of fluvial and aeolian sand, water saturated in poorly drained areas.

The first three of these study units are excluded from this study without further consideration. The fourth study unit is excluded from the study where, in conjunction with a terrain analysis (see below), suitable areas for archaeological sites are lacking.

All areas of the fifth study unit are included as potential sampling areas, notwithstanding the inclusion of areas which are "water saturated in poorly drained areas".

### 1.1.3.2 Soils Mapping (AOSERP 1978)

Soil types within the study area include Dover, Kenzie, Alger, Bitumont, Mildred, Ruth and Heart. Heart and Mildred soils are brunisols while the remainder are either luvisols or organic soils. Areas of organic soils are excluded from the scope of the project. All soil units with significant gleysolic components were also excluded as their presence is indicative of poorly drained conditions. Luvisols may be well or imperfectly drained. The inclusion of significant components of organic soils suggests poor drainage conditions, and such areas are excluded from this study. Locations within the study area which are characterized by "Dover" luvisols are included within the study only where terrain analysis suggests the presence of undulating terrain with marked topographic highs (ridges and knolls).

### 1.1.4 Terrain Analysis

Soil type and vegetation distributions to which archaeological sites are found to be associated (e.g., Ronaghan 1981a; Syncrude 1973) are, in part, a function of terrain. For the purpose of the Historical Resources Impact Assessment of the Syncrude Canada Lease 22, the first priority of archaeological survey is the examination of well-drained terrain features. Available 1:20,000 scale, 2 m contour mapping of the study area permits us to delineate well-defined features. Although at 1:10,000 scale, the 2 m contour data available on the Alsands Project (Ronaghan 1981a) proved to be a reliable method of delineating areas of archaeological potential. There, almost all raised areas were: 1) characterized by Mildred (brunisolic) soils, 2) well-drained, 3) characterized by aspen, aspen-pine vegetation and 4) of excellent archaeological potential as demonstrated by archaeological survey (e.g., Ronaghan 1981a; Ives 1982).

The delineation of raised areas of the kind found within the

Alsands Lease involves little more than mapping closed contour features less than 200 m in diameter or ridge-like features less than approximately 100 m in width. Unlike Lease 13, Syncrude Canada Ltd. Lease 22 contains several major tributaries of the Athabasca River. There, escarpments, which do not occur in Lease 13, exhibit excellent archaeological potential as indicated by previous studies of Lease 17 (Syncrude Canada Ltd. 1973). The mapping of escarpments directly from contour information is subject to considerable error. In general, it is possible to define areas immediately adjacent to linear clusters of closely spaced contours which themselves lack closely spaced contours. As mapped, these areas tend to be associated with water bodies including the Athabasca, Beaver, MacKay and Dover rivers, thus providing coverage of areas which judgmentally are inferred to exhibit excellent archaeological potential.

### 1.1.5 Operations

The Historical Resources Impact Assessment will involve the detailed examination of areas which are indicated to have archaeological potential as defined in the terrain analysis. As a second order of priority, those areas mapped as containing non-organic soils would be examined through air photo interpretation, aerial reconnaissance and field study to locate raised, non-wet areas for examination. As a last order of priority, areas excluded from the scope of the project would be subjected to aerial reconnaissance to determine whether minor, well-drained locations are included within the study area. These would then be examined. It is anticipated that the level of effort available for the latter component of the study would be marginal.

### 1.1.5.1 Methods

The areas of archaeological potential defined here are either linear or areal. Linear areas, such as an escarpment, would be examined by three persons walking in parallel lines and separated by approximately 25 to 50 m. Areas of moderate to high archaeological potential, as defined by the mapped features or the presence of micro-topographic features, would be shovel tested. Clusters of tests, rather than systematic interval tests, would be excavated, thus increasing the potential for site discovery. It is anticipated that a minimum of three tests would constitute a cluster. A similar approach would be used in areal sampling areas. There, parallel traverses would be used to locate, on the ground, suitable micro-topographic features. These would also be tested using clusters of tests rather than systematic interval tests.

#### 1.1.5.1.1 Techniques

Shovel tests would measure approximately 50 cm on a side and would be excavated to a depth of approximately 35 cm. Hand screening of tests would be confined to the assessment of prehistoric sites and would involve only a sample of the multiple shovel tests used to assess the site. Assessment tests would be placed in a radial pattern over the find and spaced at a distance of no greater than five metres from one another. All prehistoric and historic sites would be photographed and applicable information recorded and compiled onto Archaeological Survey of Alberta Site Inventory Forms.

### 1.1.6 Special Areas

In addition to the systematic examination of areas with archaeological potential, a component of the study would be dedicated to the assessment of known prehistoric sites, areas surrounding the Beaver River Quarry site, areas determined to have a potential for outcrops of Beaver River Sandstone, and areas in proximity to the confluence of the MacKay River reported to contain an historic site and fishery (e.g., Berens House). Some of these tasks would be undertaken in conjunction with systematic coverage of areas within the lease while others would represent identifiable components of the study.

# LITHIC ANALYSIS APPENDIX 3

## LITHIC ANALYSIS

Two thousand eight hundred forty-six artifacts were recovered from thirty-five prehistoric sites observed in the course of this study (Tables 4 and 5). Of these, 19 were identified as tools (Table 5). Given the proximity to the Beaver River Quarry site (HgOv-29) to most of the significant sites, it was predictable that greater than 99% of the material would involve the use of Beaver River Sandstone (Table 6). Other lithic materials include chert (N=2) and quartzite (N=8).

### TOOLS

The 19 formed tools include bifaces (N=4), unifaces (N=2), scrapers (N=3), retouched cores, flakes and pebbles (N=10).

### Bifaces

Form and Modification: The four biface fragments are all crudely executed on Beaver River Sandstone and represent between 25% and 75% of the finished specimens. HgOv-70 produced two specimens. The first (#399) is 8.2 cm in length, 4.2 cm in width, 1.4 cm in thickness and weighs 53.0 g. The specimen is ovate in form with a relatively straight base and ragged lateral margins and plano-convex in cross section. Specimen #400 (Plate 29:3) represents a utilized lateral margin and is 7.9 cm in length, 2.4 cm in width, 1.2 cm in thickness, and weighs 20.8 g. The specimen is characterized by a ragged lateral margin with one surface having been mostly removed in the breakage responsible for the remaining edge. Specimen #212 from HgOv-64 is 6.5 cm in length, 1.9 cm in width, 2.1 cm in thickness and weighs 26.5 g. The specimen represents the ragged flaked marginal edge of a bifacial tool which was roughly trianguloid and thick in cross section. Specimen #1 from HgOv-58 (Plate 29:2) is plano-convex in cross section, lanceolate in form and by comparison with other

TABLE 6: LITHIC TOOLS/MATERIAL TYPE FREQUENCY - SYNCRUDE LEASE 22

| ARTIFACT TYPE | MATERIAL TYPE | | | |
|---|---|---|---|---|
| | Beaver River Sandstone | Quartzite | Chert | TOTALS |
| Biface/Biface Fragment | 4 | | | 4 |
| Uniface | 2 | | | 2 |
| Scraper | 2 | 1 HgOv-58 | | 3 |
| Retouch/Utilized Core | 2 | | | 2 |
| Retouch/Utilized Pebble | | | 1 HgOv-70 | 1 |
| Retouch/Utilized Flake | 6 | 1 HgOv-69 | | 7 |
| Core/Core Fragment | 147 | 1 HgOv-29 | | 148 |
| | | 1 HgOw-06* | | 1 |
| Primary Decortication Flake | 68 | | | 68 |
| Secondary Decortication Flake | 464 | 1 HgOv-70 | | 465 |
| Core Reduction Flake | 1149 | 1 HgOw-06 | | 1150 |
| Ridge Flake | 56 | | | 56 |
| Retouch/Resharpening Flake | 297 | | | 297 |
| Thinning Flake | 52 | 1 HgOv-73 | | 53 |
| Shatter | 367 | | | 367 |
| Block Shatter | 219 | | | 219 |
| Split Pebble | | 1 HgOw-06 | 1 HgOv-74 | 2 |
| TOTALS | 2835 | 8 | 2 | 2845 |

* Salt and Pepper Quartzite

available specimens, more or less finished. The specimen is 7.1 cm in length, 2.5 cm in width and 1.0 cm in thickness. The specimen weighs 29.5 g.

## Unifaces

Form and Modification: Unifaces are here distinguished by evidence of modification to only one surface of a specimen. Two unifaces were recovered from HgOv-29 outside of the mapped boundaries. Specimen #608 (Plate 29:4) is more or less circular in form and plano-convex in cross section. The specimen is 4.6 x 4.1 by .9 cm and weighs 23.5 g. The second specimen (#680; Plate 29:1) is 7.0 cm in length, 3.8 cm in width and 1.3 cm in thickness. It weighs 44.5 g. This specimen is trianguloid in outline with a convex and rounded proximal edge and plano convex in cross section. Both specimens were manufactured on Beaver River Sandstone.

## Scrapers

Form and Modification: Scrapers are distinguished here by unifacial workmanship, with lateral edge modification confined to one or more lateral edges, but excluded from one or more lateral edges. Side scrapers are characterized by edge modification parallel to the long axis, and end scrapers are characterized by edge modification parallel to the short axis. Specimen #421 from HgOv-70 (Plate 29:5) is trianguloid in outline, plano-convex in cross section and distinguished by truncated left and proximal margins. Edge modification is restricted to the right lateral margin. The specimen is 11.6 cm in length, 6.6 cm in width and 1.5 cm in thickness. The large specimen weighs 195 g. Specimen #22 from HgOv-57 is small, square in outline, asymmetrical, and modified along the left lateral margin only. Edge modification is restricted to patterned retouch. The specimen is 1.5 cm in length, 1.4 cm in width and .4 cm in thickness. The specimen weighs 2.0 g. Specimen #2 (HgOv-58) is of a purple, fine-grained quartzite and distinguished by a rounded, worked lateral margin with straight, left lateral margin and angled, right lateral margin (Plate 29:6). The specimen is, by comparison to other specimens, finely made.

## Retouched Cores and Flakes

Form and Modification: Retouched flakes and core fragments are distinguished by short segments of intentional, patterned, retouch along one or more margins. These specimens are irregular and non-patterned in form and outline. The modified margins range from less than a centimetre to 3.6 cm, the latter (HgOv-31, #3781) approaching the definition of a side scraper. All but one of the specimens involve Beaver River Sandstone. Specimen #263 (HgOv-70) involved modification to a split black pebble chert. Basic measures are provided below.

| SITE | CATALOGUE NUMBER | LENGTH | WIDTH | THICKNESS | WEIGHT |
|---|---|---|---|---|---|
| HgOv-31 | #3781 | 3.6 cm | 1.9 cm | .6 cm | 9.0 g |
| HgOv-55 | #1 | 5.0 cm | 2.1 cm | 1.2 cm | 21.6 g |
| HgOv-59 | #22 | 2.9 cm | 1.5 cm | .5 cm | 2.8 g |
| | #119 | 2.0 cm | 1.1 cm | .1 cm | 1.2 g |
| HgOv-65 | #101 | 5.0 cm | 2.7 cm | .5 cm | 14.5 g |
| HgOv-69 | #1 | 3.9 cm | 3.2 cm | 1.5 cm | 30.5 g |
| | #2 | 7.6 cm | 2.9 cm | 2.8 cm | 103.5 g |
| HgOv-70 | #263 | 2.8 cm | 1.7 cm | .8 cm | 7.0 g |
| HgOv-80 | #1 | 3.8 cm | 2.7 cm | 1.5 cm | 21.5 g |
| HgOw-05 | #26 | 3.5 cm | 1.6 cm | .4 cm | 5.5 g |

## DEBITAGE

In addition to the tools the collections included core/core fragments (5%), primary decortication flakes (2%), secondary decortication flakes (16%), core reduction flakes (secondary flakes) (41%), ridge flakes (2%), retouch/resharpening flakes (11%), thinning flakes (2%), shatter (13%), and block shatter (8%). In addition, split pebbles were represented (less than 1%). These classes of artifacts may be subdivided to some degree according to function. Cores, core fragments, primary decortication flakes and secondary decortication flakes along with shatter are normally associated with the primary reduction of the raw lithic material and, within the Syncrude study area, likely associated with quarrying operations. Secondary (reduction) flakes are distinguished by a lack of cortical surfaces. Normally this class is associated with the reduction of a blank which could have been transported from a quarry site. These specimens represent the final stages of core reduction and the initial stages of manufacture. Thinning, ridge and retouch/resharpening flakes are clearly associated with the formation of a tool and express carefully controlled workmanship. They are associated with both the final stages of tool manufacture and the maintenance of tools (retouch/resharpening).

The percentages of the various classes of artifacts are illustrated in Figure 8 for the collection at large. The percentage of these classes at individual sites is illustrated in Figure 9.

Viewed as functional groups as described above, quarrying, reduction and manufacturing/maintenance are represented by 44%, 41% and 15% of the assemblage respectively.

On a site specific basis, functional differences between the sites should be evidenced to some degree. One would, for example, assume that sites further from the Beaver River Quarry would exhibit a higher percentage of reduction and/or manufacturing/maintenance artifacts. Figure 8 illustrates the relationship between the various groups of artifact classes as expressed at individual sites. Sites noted by a filled zero along the legend line are associated with the Beaver River. For purposes of this illustration, isolated and small finds of one artifact type were removed from the inventory of sites considered. The figure illustrates the variation in artifactual assemblages both for sites adjacent to the Beaver River, those located away from the quarry site, and those between these sites.

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